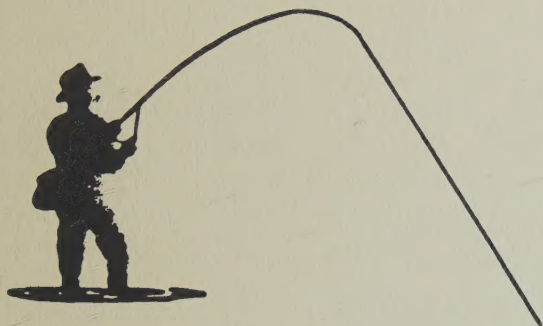


29(1)

29(1)



SPORT FISHERY ABSTRACTS

LIBRARY

MAY 29 1984

National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii

Vol. 29, No. 1, 1984



DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR



SPORT FISHERY ABSTRACTS

Roger Schoumacher, Editor

Editorial Office
U.S. Fish and Wildlife Service
Aylesworth Hall, CSU
Fort Collins, Colorado 80523

Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

The U.S. Fish and Wildlife Service assumes no responsibility for the accuracy of material from outside sources, and can only supply copies of articles written and published by the U.S. Fish and Wildlife Service.



SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 29(1)

1984

CONTENTS

AQUATIC PLANTS AND THEIR CONTROL.....	1
---------------------------------------	---

CULTURE AND PROPAGATION

General Fish Culture.....	1
Trout and Salmon Culture.....	1
Warmwater Culture.....	2
Mariculture.....	4
Feeds, Feeding and Nutrition.....	4
Transporting Fish.....	7
Miscellaneous Culture Techniques and Equipment.....	7

LIMNOLOGY AND OCEANOGRAPHY

Physical.....	8
Plankton.....	8

MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR

Morphology.....	8
Physiology.....	15
Genetics, Variation Studies, Hybridization.....	37
Behavior.....	43

NATURAL HISTORY

Life Histories - General Works.....	47
Population Studies - Production, Standing Crop, Recruitment.....	53
Spawning Habits and Movements, Sex Ratios, Fecundity, etc... ..	55
Movements, Seasonal and Depth Distribution, etc.....	59
Foods and Feeding.....	62
Age and Growth.....	71
Geographical Distribution, Fish surveys, etc.....	75
Abundance, Factors of; Survival and Mortality.....	77
Identification, Keys, Classification.....	80

PARASITES AND DISEASES

General.....	83
Bacterial.....	85
Fungal.....	85
Protozoan.....	86
Viral.....	86
Other.....	87

POLLUTION AND TOXICOLOGY

Pollution.....	90
Fish Kills.....	95
Toxicology; Bioassays.....	95

RESEARCH AND MANAGEMENT

General.....	105
Administration and Planning.....	106
Reports of Fishery Stations, States, etc.....	106
Habitat Alteration.....	106
Harvest, Creel Census, etc.....	108
Regulations.....	108
Fish Control and Removal.....	109
Marking and Tagging.....	109
Stocking and Introductions.....	109
Fishing Gear and Techniques.....	110
Fishways, Fish Passage through Dams, etc.....	111
Mathematical, Statistical Methods and Modeling.....	112
River and Stream Management and Research.....	114
Farm Pond and Small Impoundment Management and Research.....	116
Large Impoundment Management and Research.....	116
Estuary Management and Research.....	117
Marine Management and Research.....	117
Utilization of Fishery Products.....	119
Miscellaneous Techniques and Equipment.....	119
Reviews, Bibliographies, etc.....	119
AUTHOR INDEX (Salmon).....	121
GEOGRAPHICAL INDEX (Yellow).....	147
SYSTEMATIC INDEX (Blue).....	151

AVAILABILITY OF REPRINTS AND PUBLICATIONS

SPORT FISHERY ABSTRACTS does not distribute any of the papers abstracted herein, nor can the editor of SPORT FISHERY ABSTRACTS undertake to obtain copies of these papers for anyone. A reprint of an article published in a journal may be available from the author, from the organization with which the author is affiliated, or from the publisher of the journal in which the article appeared. When an author's address is known, it is shown in square brackets following the citation. Addresses of most wildlife organizations can be obtained from the CONSERVATION DIRECTORY, an annual publication available from the National Wildlife Federation, 1412 16th Street, N.W., Washington, D. C. 20036, at a price of \$9.00 per copy plus \$1.55 postage and handling. This directory lists more than 900 agencies and organizations concerned with natural resources use.

SPORT FISHERY ABSTRACTS

AQUATIC PLANTS AND THEIR CONTROL

84-000001 Leslie, A. J., Jr.; L. E. Nall and J. M. Van Dyke. EFFECTS OF VEGETATION CONTROL BY GRASS CARP ON SELECTED WATER-QUALITY VARIABLES IN FOUR FLORIDA LAKES. *Trans. Am. Fish. Soc.* 112(6):777-787. Nov. 1983. SFA 29(1)

[Fla. Dep. Nat. Resour., 3900 Commonwealth Blvd., Tallahassee 32303]

84-000002 Robinson, M. G. and L. N. Brown. A RECURRENT RED TIDE IN A BRITISH COLUMBIA COASTAL LAGOON. *Can. J. Fish. Aquatic Sci.* 40(12):2135-2143. Dec. 1983. In English with French summ. SFA 29(1)

[Royal Roads Military Coll., Victoria, BC V0S 1B0, Canada]

GENERAL FISH CULTURE

84-000003 FAO of the UN. FRESHWATER AQUACULTURE DEVELOPMENT IN CHINA. *FAO Fish. Tech. Pap.* 215. xiii + 124p. 1983. SFA 29(1)

[Rome, Italy]

84-000004 FAO of the UN. SECOND SESSION OF THE WORKING PARTY ON AQUACULTURE. *FAO Fish. Rep. No.* 287. v + 14p. 1983. SFA 29(1)

[Rome, Italy]

84-000005 Jennings, F. D.; A. M. Beeton; J. R. Davidson; W. S. Gaither; and M. Gilmartin. SEA GRANT AQUACULTURE PLAN. 1983-1987. *Tex. A & M Univ. Sea Grant Prog.* TAMU-SG-82-114. 53p. July 1982. From U.S. Government Reports 83(6):966. 18 Mar. 1983. Available from NTIS as PB83-138297. SFA 29(1)

84-000006 Shaw, W. N. (ed.). PROCEEDINGS OF THE EIGHTH U.S.-JAPAN MEETING ON AQUACULTURE AT BELLINGHAM, WASHINGTON, OCTOBER 17-18, 1979. *NOAA Tech. Rep. NMFS Circ.* 447. iii + 25p. Nov. 1982. SFA 29(1)

TROUT AND SALMON CULTURE

84-000007 Bams, R. A. and C. N. H. Lam. INFLUENCE OF DETERIORATING WATER QUALITY ON GROWTH AND DEVELOPMENT OF CHUM SALMON (*ONCORHYNCHUS KETA*) LARVAE IN A JAPANESE-STYLE KEEPER CHANNEL. *Can. J. Fish. Aquatic Sci.* 40(12):2098-2104. Dec. 1983. In English with French summ. SFA 29(1)

[Dep. Fish. Oceans, Fish. Res. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-000008 Crim, L. W.; A. M. Sutterlin; D. M. Evans and C. Weil. ACCELERATED OVULATION BY PELLETTED LHRH ANALOGUE TREATMENT OF SPRING-SPAWNING RAINBOW TROUT (*SALMO GAIRDNERI*) HELD AT LOW TEMPERATURE. *Aquaculture* 35(4):299-307. Dec. 1983. SFA 29(1)

[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

84-000009 Messamer, R. K. EXPERIMENTAL USE OF A FRY SORTER AT CLARK'S FORK HATCHERY IN WYOMING. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish Soc.* 18:81-86. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711

SPORT FISHERY ABSTRACTS

TROUT AND SALMON CULTURE (CONTINUED)

84-000009 CONTINUED Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Wyo. Game Fish Dep., Star Route, Box 81, Belfry, MT 59008] An experimental fry sorter was built at Clark's Fork Hatchery, Wyoming Game and Fish Department, to test the usefulness of this tool on large production lots of trout. It was used with both brown trout (*Salmo trutta*) and fall-spawn rainbow trout (*Salmo gairdneri*). The sorter was constructed of materials on hand, and consists of a box-like frame with an inclined ramp of woven brass wire and an open front. Theoretically, the sorter allows healthy fish to swim out into the rearing tank proper, but retains weak and crippled fish inside for easy disposal. In practice, its effectiveness was somewhat less than that considered theoretically possible. However, at least two useful observations resulted from this experiment; 1) traditional timing of the dumping of fry was reaffirmed, and 2) delaying the first cleaning of rearing tanks for three to four days seemed to reduce early mortality significantly.

84-000010 Voelker, J. L. THE EFFECT OF ARTIFICIAL INCUBATION SUBSTRATES ON THE GROWTH AND SURVIVAL OF BROWN TROUT FRY. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:87-90. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Rifle Falls Hatchery, Colo. Div. Wildl., 11466 State Highway 325, Rifle 81650] Brown trout (*Salmo trutta*) alevins were incubated in Heath Tecna vertical tray incubators containing rugose plastic substrates and compared to alevins incubated on smooth screen in floating trays, and on smooth screen in deep baskets. Both screen-substrate groups exhibited a much higher incidence of yolk sac malformation and coagulation than did the plastic-substrate group. After seven weeks of feeding, fry incubated in plastic substrates were significantly heavier than fry incubated on either of the smooth screens ($p < .05$). During the seven weeks of feeding, cumulative mortality appeared to be less in the plastic-substrate group (3.9% versus an average of 6.7% for both smooth-screen groups).

WARMWATER CULTURE

84-000011 Barash, H. and G. L. Schroeder. USE OF FERMENTED COW MANURE AS A FEED SUBSTRATE FOR FISH POLYCULTURE IN STAGNANT WATER PONDS. *Aquaculture* 36(1-2):127-140. 1 Jan. 1984. SFA 29(1)

[Inst. Anim. Sci., ARO, The Volcani Center, Bet Dagan 50250, Israel]

84-000012 Bok, A. H. and H. Jongbloed. GROWTH AND PRODUCTION OF SHARPTOOTH CATFISH, *CLARIAS GARIEPINUS* (PISCES: CLARIIDAE), IN ORGANICALLY FERTILIZED PONDS IN THE CAPE PROVINCE, SOUTH AFRICA. *Aquaculture* 36(1-2):141-155. 1 Jan. 1984. SFA 29(1)

[Cape Dep. Nature Environ. Conserv., P. B. 1006, Grahamstown 6140, South Africa]

84-000013 Bowser, P. R.; W. W. Falls; J. VanZandt; N. Collier and J. D. Phillips. METHEMOGLOBINEMIA IN CHANNEL CATFISH: METHODS OF PREVENTION. *Prog. Fish-Cult.* 45(3):154-158. July 1983. SFA 29(1)

[Coll. Vet. Med., Miss. State Univ., Drawer V, Mississippi State 39762]

84-000014 Harvey, B. and R. N. Kelley. CHILLED STORAGE OF *SAROTHERODON MOSSAMBICUS* MILT. *Aquaculture* 36(1-2):85-95. 1 Jan. 1984. SFA 29(1)

[Dep. Biol., Univ. Victoria, P.O. Box 1700, Victoria, BC V8W 2Y2, Canada]

WARMWATER CULTURE (CONTINUED)

84-000015 Hutson, P. L. SMALLMOUTH BASS CULTURE IN TEXAS. *Prog. Fish-Cult.* 45(3):169-171. July 1983. SFA 29(1)

[Tex. Parks Wildl. Dep., State Fish Hatchery, Box 947, San Marcos 78666]

84-000016 Johnson, H. E. and D. J. Duffield. UTILIZATION OF WASTEWATER FOR INTENSIVE FISH CULTURE. *Mich. State Univ. Inst. Water Res. Rep.* OWRT-A-082-MICH(2). 4lp. Sept. 1980. From U.S. Government Reports 83(10):2138. 13 May 1983. Available from NTIS as PB83-154351. SFA 29(1)

Channel catfish were reared in 0.8 cu m cages in a southern Michigan farm pond and a pond which received secondary treated domestic wastewater. Cages were stocked in May with 117 mm fingerlings at densities of 50, 100 and 150 fish per cubic meter. The fish production in the farm pond was approximately 44.8 kg/cu m compared with 12.5 kg/cu m in the wastewater pond. The lower production in the wastewater pond was probably due to adverse water quality conditions including high pH, low dissolved oxygen and high concentrations of unionized ammonia. The results indicate that cage culture is not suitable in highly enriched wastewater ponds with extensive plant growth but successful cage culture may be practiced in southern Michigan farm ponds.

84-000017 Juario, J. V.; M. N. Duray; V. M. Duray; J. F. Nacario and J. M. E. Almendras. INDUCED BREEDING AND LARVAL REARING EXPERIMENTS WITH MILKFISH *CHANOS CHANOS* (FORSKAL) IN THE PHILIPPINES. *Aquaculture* 36(1-2):61-70. 1 Jan. 1984. SFA 29(1)

[Aquacult. Dep., Southeast Asian Fish. Dev. Cent., P.O. Box 256, Iloilo City, Philippines] Salmon pituitary homogenate was used alone or in combination with human chorionic gonadotropin, to induce spawning in captive and wild adult milkfish at ambient temperature (26°-30°C) and salinity of 34‰. Healthy or slightly injured females having oocytes with a minimum mean diameter of 0.66 mm could be induced to spawn in captivity using a total dose of 20 mg SPH/kg + 3000 IU HCG/kg given in two injections. Badly injured females did not respond readily to the hormone and required more than two injections to induce ovulation. Milkfish larvae were reared successfully to metamorphosis using only *Chlorella*-fed rotifers during the first 10 days. Survival rates were greatly improved when, aside from *Chlorella* and *Chlorella*-fed rotifers, *Isochrysis galbana* and *Tetraselmis chuii* were added to the rearing tanks.

84-000018 Mollah, M. F. A. and E. S. P. Tan. HCG-INDUCED SPAWNING OF THE CATFISH, *CLARIAS MACROCEPHALUS* (GUNTHER). *Aquaculture* 35(3):239-247. Nov. 1983. SFA 29(1)

[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia]

84-000019 Moscoso, J. C. and H. R. Alva. EVALUACION DEL CRECIMIENTO Y LA PRODUCCION DE TILAPIA HERBIVORA Y CARPA COMUN BAJO CULTIVO EXTENSIVO EN EL REPRESAMIENTO DE SAN JUAN-LA MERCED. [EVALUATION OF GROWTH AND PRODUCTION OF GRASS TILAPIA AND COMMON CARP UNDER EXTENSIVE CULTIVATION IN THE SAN JUAN-LA MERCED IMPOUNDMENT.] *An. Cient. (La Molina)* 18:95-100. 1980. In Spanish with English summ. SFA 29(1)

[Ing. Pesq., Prof. Aux., Dep. Piscicult. Oceanol., UNA La Molina, Peru]

84-000020 Rowland, S. J. THE HORMONE-INDUCED OVULATION AND SPAWNING OF THE AUSTRALIAN FRESHWATER FISH GOLDEN PERCH, *MACQUARIA AMBIGUA* (RICHARDSON) (PERCICHTHYIDAE). *Aquaculture* 35(3):221-238. Nov. 1983. SFA 29(1)

[N.S.W. State Fish., Inland Fish. Res. Stn., P.O. Box 182, Narrandera, N.S.W., 2700 Australia]

SPORT FISHERY ABSTRACTS

WARMWATER CULTURE (CONTINUED)

84-000021 Rowland, S. J. SPAWNING OF THE AUSTRALIAN FRESHWATER FISH MURRAY COD, *MACCULLOCHELLA PEELI* (MITCHELL), IN EARTHEN PONDS. *J. Fish Biol.* 23(5):525-534. Nov. 1983. SFA 29(1)
[Inland Fish. Res. Stn., N.S.W. State Fish., Narrandera, N.S.W., 2700 Australia]

84-000022 Shireman, J. V.; F. J. Aldridge and R. W. Rottman. GROWTH AND FOOD HABITS OF HYBRID CARP, *CTENOPHARYNGODON IDELLA* X *ARISTICHTHYS NOBILIS*, FROM AERATED AND NON-AERATED PONDS. *J. Fish Biol.* 23(5):595-604. Nov. 1983. SFA 29(1)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville]

84-000023 Sokolowska, M.; R. E. Peter; C. S. Nahorniak; C. H. Pan; J. P. Chang; L. W. Crim and C. Weil. INDUCTION OF OVULATION IN GOLDFISH, *CARASSIUS AURATUS*, BY PIMOZIDE AND ANALOGUES OF LH-RH. *Aquaculture* 36(1-2):71-83. 1 Jan. 1984. SFA 29(1)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

84-000024 Spataru, P.; G. W. Wohlfarth and G. Hulata. STUDIES ON THE NATURAL FOOD OF DIFFERENT FISH SPECIES IN INTENSIVELY MANURED POLYCULTURE PONDS. *Aquaculture* 35(4):283-298. Dec. 1983. SFA 29(1)
[Fish Aquacult. Res. Stn., Dor, Mobile Post, Hof Hacarmel 30-820, Israel]

84-000025 Tackett, D. L. and R. R. Carter. USE OF SURFACE WATER FOR REARING CHANNEL CATFISH IN PONDS. *Prog. Fish-Cult.* 45(3):179-180. July 1983. SFA 29(1)
[Fish. Farm. Exp. Stn., U.S. FWS, Stuttgart, AR 72160]

84-000026 Watkins, E. J.; H. G. Leggett; G. F. Pessoney and R. T. van Aller. PROBLEMS IN INTENSIVE CULTURE OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Am. Zool.* 23(4):888. 1983. Abstract only. SFA 29(1)
[Univ. South. Miss., Hattiesburg]

MARICULTURE

84-000027 Geiger, J. G. ZOOPLANKTON PRODUCTION AND MANIPULATION IN STRIPED BASS REARING PONDS. *Aquaculture* 35(4):331-351. Dec. 1983. SFA 29(1)
[U.S. FWS, Southeast Fish Cult. Lab., Rt. 3, Box 86, Marion, AL 36756]

FEEDS, FEEDING, AND NUTRITION

84-000028 Fagerlund, U. H. M.; I. McCallum; D. A. Higgs; J. R. McBride; M. D. Plotnikoff and B. S. Dosanjh. DIET COMPOSITION AS A FACTOR IN THE ANABOLIC EFFICACY OF 3,5,3'-TRI-IODO-L-THYRONINE ADMINISTERED ORALLY TO STEELHEAD TROUT (*SALMO GAIARDNERI*). *Aquaculture* 36(1-2):49-59. 1 Jan. 1984. SFA 29(1)
[Dep. Fish. Oceans, West Vancouver Lab., 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

SPORT FISHERY ABSTRACTS

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

84-000029 Flicking, S. A. and J. F. Smeltzer. TRAINING SPOTTED BASS TO ACCEPT A PREPARED DIET. *Prog. Fish-Cult.* 45(3):185-186. July 1983. SFA 29(1)

[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

84-000030 Goolish, E. M. and I. R. Adelman. EFFECTS OF RATION SIZE AND TEMPERATURE ON THE GROWTH OF JUVENILE COMMON CARP (*CYPRINUS CARPIO* L.). *Aquaculture* 36(1-2):27-35. 1 Jan. 1984. SFA 29(1)

[Dep. Entomol. Fish. Wildl., Minn. Agric. Exp. Stn., St. Paul 55108]

84-000031 Helfrich, L. A.; J. C. Dean; D. L. Weigmann and L. A. Nielsen. EVALUATION OF SEAFOOD PROCESSING WASTES AS A PROTEIN SOURCE IN RAINBOW TROUT DIETS. *Va. J. Sci.* 34(3):123. 1983. Abstract only. SFA 29(1)

[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Disposal of seafood processing wastes is a significant problem for the seafood industry. In this study, we compared the growth response, survival, and feed conversion efficiency of cage-cultured rainbow trout (*Salmo gairdneri*) fed a control diet (Purina Trout Chow) with two experimental diets containing either herring (*Clupea harengus*) cannery residue or blue crab (*Callinectes sapidus*) scrap to evaluate the feasibility of using seafood wastes as dietary protein supplements in pelleted trout rations. One hundred rainbow trout fingerlings (40 g average) were stocked into each of nine floating cages (1 m³) and fed one of the three diets of 3% of live body weight per day for 179 days. Growth, production, survival, and feed conversion efficiency were significantly greater ($p < 0.05$) for trout reared on the control diet than either of the experimental diets. Growth, production, and feed conversion were significantly greater for trout reared on herring scrap than on the crab waste diet. Survival rates were similar for both experimental diets.

84-000032 Hilton, J. W. and S. J. Slinger. EFFECT OF WHEAT BRAN REPLACEMENT OF WHEAT MIDDINGS IN EXTRUSION PROCESSED (FLOATING) DIETS ON THE GROWTH OF JUVENILE RAINBOW TROUT (*SALMO GAIRDNERI*). *Aquaculture* 35(3):201-210. Nov. 1983. SFA 29(1)

[Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

84-000033 Hubbert, R. M. THE EFFECT OF ANAEROBICALLY DIGESTED ANIMAL WASTE ON THE BACTERIAL FLORA OF COMMON CARP (*C. CARPIO* L.). *Bamidgeh* 35(3):73-78. Sept. 1983. SFA 29(1)

[Lab. Res. Fish. Dis., Nir David, Israel] Maintaining benthic feeding fish (carp) on a diet of anaerobically digested slurry failed to reveal a danger to the consumer from infection with either *Shigella* spp. or *Salmonella* spp. The absence of serum agglutinating antibodies indicated that infection with *S. typhimurium* at least did not take place during this study. A change in the gut flora of the fish was observed suggesting that the slurry had a destabilizing effect on the gut ecosystem. There was an increase in the occurrence of *Edwardsiella* spp. in the gut of fish maintained on slurry indicating that the use of this material could have serious health problems, if used in the culture of certain fish species.

84-000034 Hughes, S. G.; G. L. Rumsey and M. C. Nesheim. DIETARY REQUIREMENTS FOR ESSENTIAL BRANCHED-CHAIN AMINO ACIDS BY LAKE TROUT. *Trans. Am. Fish. Soc.* 112(6):812-817. Nov. 1983. SFA 29(1)

[U.S. FWS, Tunison Lab. Fish Nutr., 28 Gracie Rd., Cortland, NY 13045]

SPORT FISHERY ABSTRACTS

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

- 84-000035 Murai, T.; Y. Hirasawa; T. Akiyama and T. Nose. EFFECTS OF DIETARY pH AND ELECTROLYTE CONCENTRATION ON UTILIZATION OF CRYSTALLINE AMINO ACIDS BY FINGERLING CARP. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1377-1380. Sept. 1983. SFA 29(1)
[Div. Fish. Nutr., Natl. Inst. Aquacult., Tamaki, Watarai, Mie 510-04, Japan]
- 84-000036 Noeske, T. A.; R. E. Spieler and N. C. Parker. TIME-OF-DAY OF FEEDING AFFECTS GROWTH, FATTENING, AND SERUM HORMONE LEVELS IN CHANNEL CATFISH. *Am. Zool.* 23(4):910. 1983. SFA 29(1)
[Milwaukee Publ. Mus., Milwaukee, WI] Channel catfish *Ictalurus punctatus* were maintained on a 12L:12D photoperiod, 20° ± 1°C, and received one of two commercial diets either early (0730 h), late (1600 h), or at both times of day (feeding rate 2.5 g% body weight/day). After 6 weeks of feeding, body weight, body length, abdominal fat weight and mean serum cortisol and thyroxine levels (determined by radioimmunoassay) differed among feeding regime groups depending on the diet, time-of-day of feeding and/or feeding frequency. There were also diel variations in serum cortisol and thyroxine titers; the patterns of serum cortisol and thyroxine differed with diet and time-of-day of feeding, respectively.
- 84-000037 Ogata, H.; S. Arai and T. Nose. GROWTH RESPONSES OF CHERRY SALMON *ONCORHYNCHUS MASOU* AND AMAGO SALMON *O. RHODURUS* FRY FED PURIFIED CASEIN DIETS SUPPLEMENTED WITH AMINO ACIDS. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1381-1385. Sept. 1983. SFA 29(1)
[Div. Fish Nutr., Natl. Res. Inst. Aquacult., Tamaki, Mie 519 04, Japan]
- 84-000038 Reinitz, G. INFLUENCE OF DIET AND FEEDING RATE ON THE PERFORMANCE AND PRODUCTION COST OF RAINBOW TROUT. *Trans. Am. Fish. Soc.* 112(6):830-833. Nov. 1983. SFA 29(1)
[U.S. FWS, Beulah Fish Technol. Cent., P.O. Box 245, Beulah, WY 82712]
- 84-000039 Rumsey, G. L.; J. W. Page and M. L. Scott. METHIONINE AND CYSTINE REQUIREMENTS OF RAINBOW TROUT. *Prog. Fish-Cult.* 45(3):139-143. July 1983. SFA 29(1)
[U.S. FWS, Tunison Lab., 28 Gracie Rd., Cortland, NY 13045]
- 84-000040 Tacon, A. G. J.; J. V. Haaster; P. B. Featherstone; K. Kerr and A. J. Jackson. STUDIES ON THE UTILIZATION OF FULL-FAT SOYBEAN AND SOLVENT EXTRACTED SOYBEAN MEAL IN A COMPLETE DIET FOR RAINBOW TROUT. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1437-1443. Sept. 1983. SFA 29(1)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, U.K.]
- 84-000041 Tacon, A. G. J.; E. A. Stafford and C. A. Edwards. A PRELIMINARY INVESTIGATION OF THE NUTRITIVE VALUE OF THREE TERRESTRIAL LUMBRICID WORMS FOR RAINBOW TROUT. *Aquaculture* 35(3):187-199. Nov. 1983. SFA 29(1)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, U. K.]
- 84-000042 Takeuchi, T.; S. Satoh and T. Watanabe. [DIETARY LIPIDS SUITABLE FOR THE PRACTICAL FEED OF *TILAPIA NILOTICA*.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1361-1365. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Lab. Fish Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

SPORT FISHERY ABSTRACTS

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

84-000043 Wekell, J. C.; K. D. Shearer and C. R. Houle. HIGH ZINC SUPPLEMENTATION OF RAINBOW TROUT DIETS. *Prog. Fish-Cult.* 45(3):144-147. July 1983. SFA 29(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-000044 Winfree, R. A. STARTER DIETS FOR CHANNEL CATFISH: EFFECTS OF FORMULATION ON GROWTH AND BODY COMPOSITION. *Ph.D. dissertation, Tex. A & M Univ.* 105p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1657. Dec. 1983. SFA 29(1)

Production type diets were developed to support tank reared channel catfish, *Ictalurus punctatus*, until they were large enough to accept conventional pelleted rations. This was accomplished through a series of feeding trials with diets formulated by computer and using ingredients commonly available in feed mill inventories. An adequate minimum particle size for swim-up fry was found to be in the range of 0.35-0.50 mm. Growth rate of advanced fry did not appear to be limited by such a fine feed grind, as might be expected if significant nutrient leaching had occurred. A high level of crude protein (about 52% on a 90% dry matter basis) and a high protein:energy ratio (126 mg digestible protein/kcal digestible energy) supported maximum growth among swim-up stage fry. The minimum requirement appeared to decline with growth to about 50% (P:E = 122) at 0.2 g, 48% (P:E = 117) at 1.7 g and may be as low as 41-44% (P:E = 100) from 3-5 g average fish weight. Carcass composition of fry was significantly affected by dietary protein content. However, the principal effect of diet upon carcass composition during the present study appeared to be through changing the rate of gain. Carcass ash, protein and fat all increased at the expense of moisture, as the fish grew. Trials were also conducted to identify and evaluate alternative ingredients for starter diets. Fish meal was successfully reduced to supply about half of the protein in the diet of swim-up fry. The level of fish meal needed by advanced fry (3-5 g) was flexible within wide limits when the fish were fed balanced diets formulated to provide adequate levels of digestible protein and indispensable amino acids. Several animal and vegetable protein concentrates partially replaced fish meal without significant reductions in growth or changes in carcass composition. Ingredients that performed especially well included fish, poultry byproduct, soybean and cottonseed meals; brewers yeast; wheat grain and tallow. Ingredients thought to be essential or included in the past for their "unidentified growth factors" were apparently not necessary when balanced diets were manufactured with proper quality controls. Certain changes to diet formulae apparently resulted in micronutrient deficiencies, as did meal, wheat, tallow and a micronutrient premix preserved with antioxidants and propionic acid.

TRANSPORTING FISH

84-000045 Ruiz Ríos, L. TRANSPORTE DE ALEVINOS DE *TILAPIA RENDALLI* EN BOLSAS DE POLIETILENO. [TRANSPORTION OF ALEVINS OF *TILAPIA RENDALLI* IN POLYETHYLENE BAGS.] *An. Cient. (La Molina)* 18:115-120. In Spanish with English summ. SFA 29(1)
[Piscicult. Oceanol., UNA La Molina, Peru]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

84-000046 Meade, J. W.; J. T. Fuss and C. B. Mitchell. DESIGN OF SMALL, LOW-COST REARING UNIT. *Prog. Fish-Cult.* 45(3):181-182. July 1983. SFA 29(1)
[U.S. FWS, Natl. Fish. Res. Dev. Lab., Wellsboro, PA 16901]

SPORT FISHERY ABSTRACTS

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

84-000047 Roberts, D. D. and E. J. Allen. A WATER-POWERED POND CLEANER. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:91-94. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)
[Rifle Falls Hatchery, Colo. Div. Wildl., 11466 State Highway 325, Rifle 81650]

84-000048 Scott, K. R. and L. Allard. HIGH-FLOWRATE WATER RECIRCULATION SYSTEM INCORPORATING A HYDROCYCLONE PREFILTER FOR REARING FISH. *Fish-Cult.* 45(3):148-153. July 1983. SFA 29(1)
[Freshwater Inst., 501 University Crescent, Winnipeg, MB, Canada]

PHYSICAL LIMNOLOGY AND OCEANOGRAPHY

84-000049 International Council for the Exploration of the Sea. FLUSHING TIMES OF THE NORTH SEA. *Int. Counc. Explor. Sea Coop. Res. Rep.* 123. 159p. Aug. 1983. A collection of papers--RS. SFA 29(1)
[Palaegade 2-4, 1261 Copenhagen K, Denmark]

84-000050 Nelson, C. S. and D. M. Husby. CLIMATOLOGY OF SURFACE HEAT FLUXES OVER THE CALIFORNIA CURRENT REGION. *NOAA Tech. Rep. NMFS SSRF* 763. iii + 155p. Feb. 1983. SFA 29(1)
[NMFS, Fleet Numerical Oceanogr. Cent., Monterey, CA 93940]

PLANKTON

84-000051 Strickland, R. M. THE FERTILE FJORD. PLANKTON IN PUGET SOUND. xv + 145p. 10 Dec. 1983. SFA 29(1)
Available @ \$8.95 from Univ. Wash. Press, Seattle 98105]

MORPHOLOGY

84-000052 Abilkasimova, T. A. [THE USE OF CHARACTERS FEATURES FOR CHARACTERIZATION OF POPULATIONS OF *NEMACHILUS STOLIZKAI* (CYPRINIFORMES, COBITIDAE).] *Zool. Zh.* 62(9):1371-1381. 1983. In Russian with English summ. SFA 29(1)
[Kirghiz State Univ., Frunze, USSR]

84-000053 Akster, H. A. A COMPARATIVE STUDY OF THE FIBRE TYPE CHARACTERISTICS AND TERMINAL INNERVATION IN HEAD AND AXIAL MUSCLE OF THE CARP (*CYPRINUS CARPIO* L.): A HISTOCHEMICAL AND ELECTRON-MICROSCOPICAL STUDY. *Neth. J. Zool.* 33(2):164-188. Aug. 1983. SFA 29(1)
[Dep. Exp. Anim. Morphol. Cell Biol., Agric. Univ., P.O. Box 338, 6700 AH Wageningen, Netherlands]

84-000054 Ambrose, D. A.; J. L. Butler; H. G. Moser; B. Y. Sumida; E. M. Sandknop and E. G. Stevens. DESCRIPTION OF THE LARVAE OF THE CUSK EELS *OPHIDION SCRIPPSAE* AND *CHILARA TAYLORI* (FAMILY OPHIDIIDAE). *Calif.*

SPORT FISHERY ABSTRACTS

MORPHOLOGY (CONTINUED)

- 84-000054 CONTINUED *Coop. Oceanic Fish. Invest.* 24:226-234. Oct. 1983.
In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]
- 84-000055 Bailey, C. F. CELL SURFACE SPECIALIZATIONS IN *FUNDULUS*
NEURULATION. *Am. Zool.* 23(4):912. 1983. Abstract only. SFA 29(1)
[Univ. Ark., Fayetteville]
- 84-000056 Beacham, T. D. and C. B. Murray. SEXUAL DIMORPHISM IN THE
ADIPOSE FIN OF PACIFIC SALMON (*ONCORHYNCHUS*). *Can. J. Fish. Aquatic Sci.*
40(11):2019-2024. Nov. 1983. In English with French summ. SFA 29(1)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]
- 84-000057 Benjamin, M.; D. Norman; R. M. Santer and D. Scarborough.
HISTOLOGICAL, HISTOCHEMICAL AND ULTRASTRUCTURAL STUDIES ON THE BULBUS
ARTERIOSUS OF THE STICKLEBACKS, *GASTEROSTEUS ACULEATUS* AND *PUNGITIUS*
PUNGITIUS (PISCES: TELEOSTEI). *J. Zool. (Lond.)* 200(3):325-346. July 1983.
SFA 29(4)
[Dep. Anat., University College, Cardiff CF1 1XL, Wales]
- 84-000058 Bone, Q. and N. B. Marshall. THE MAUTHNER SYSTEM OF DEEP SEA
TELEOSTS. *J. Mar. Biol. Assoc. U.K.* 63(4):881-896. Nov. 1983. SFA 29(1)
[The Lab., Mar. Biol. Assoc., Citadel Hill, Plymouth, PL1 2PB, England]
- 84-000059 Borisovets, E. E.; S. S. Alekseev and M. V. Mina. MULTIVARIATE
STATISTICAL ANALYSIS OF MORPHOLOGICAL CHARACTERS OF SYMPATRIC GROUPS LENOK
OF THE GENUS *BRACHYMYSTAX* (SALMONIDAE) FROM THE LENA AND AMUR RIVER BASINS.
J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 23(2):9-25. 1983. SFA 29(1)
[Pac. Reg. Inst. Geogr., Far East. Sci. Cent., USSR Acad. Sci.,
Vladivostok, USSR]
- 84-000060 Chervinski, J. SEXING ADULT *LIZA RAMADA* (*MUGIL CAPITO*)
(MUGILIDAE) BY MEANS OF AN EXTERNAL CHARACTERISTIC. *Aquaculture* 35(3):265-
266. Nov. 1983. SFA 29(1)
[Dep. Fish., P.O. Box 699, Haifa 31000, Israel]
- 84-000061 Donald, J. A. and A. G. Ellis. ARTERIO-VENOUS ANASTOMOSES IN THE
GILLS OF AUSTRALIAN SHORT-FINNED EEL, *ANGUILLA AUSTRALIS*. *J. Morphol.*
178(1):89-93. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Melbourne, Parkville, Victoria, 3052, Australia]
- 84-000062 Dutta, H. M. and A. Hossain. MICROSCOPIC ANALYSIS OF THE
DIGESTIVE TRACT OF BLUEGILL FISH, *LEPOMIS MACROCHIRUS*. *Am. Zool.* 23(4):906.
1983. Abstract only. SFA 29(1)
[Kent State Univ., Kent, OH]
- 84-000063 Fukayama, S. and H. Takahashi. LIGHT- AND ELECTRON-MICROSCOPIC
STUDIES ON CHANGES OF THE COELOMIC EPITHELIUM OF THE JAPANESE BROOK LAMPREY,
LAMPETRA REISSNERI, DURING THE SPAWNING PERIOD. *Bull. Fac. Fish. Hokkaido*
Univ. 34(3):182-191. Aug. 1983. SFA 29(1)
[Lab. Fresh-Water Fish-Culture, Fac. Fish., Hokkaido Univ., Hakodate,
Japan]

SPORT FISHERY ABSTRACTS

MORPHOLOGY (CONTINUED)

- 84-000064 Fukuhara, O. DEVELOPMENT AND GROWTH OF LABORATORY REARED *ENGRAULIS JAPONICA* (HOULTUYN) LARVAE. *J. Fish Biol.* 23(6):641-652. Dec. 1983. SFA 29(1)
[Nansei Reg. Fish. Res. Lab., Ohno, Hiroshima, 739-04, Japan] The development and growth of Japanese anchovy larvae, *Engraulis japonica*, are described from laboratory-reared specimens. Fertilized eggs were collected from cultured parental fish. Rotifers, *Artemia* and copepods were offered to larvae of different sizes. Fin ray formation was completed at 21 mm S.L. Pigmentation during development is described. Newly hatched larvae grew to 29.38 mm standard length in 62 days. The daily length increment averaged 0.43 mm.
- 84-000065 Fulcher, A. S. and W. S. Woolcott. AN OSTEOLOGICAL OVERVIEW OF THE SEVEN *PERCINA* SPECIES IN THE SUBGENUS *ALVORDIUS* (PISCES:PERCIDAE). *Va. J. Sci.* 34(3):121. 1983. Abstract only. SFA 29(1)
[Dep. Biol., Univ. Richmond, Richmond, VA 23173]
- 84-000066 Gajdušek, J. and V. Rubcov. INVESTIGATIONS ON THE MICROSTRUCTURE OF EGG MEMBRANES IN PIKE, *ESOX LUCIUS*. *Folia Zool. (Brno)* 32(2):145-152. 1983. In English with Czech summ. SFA 29(1)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]
- 84-000067 Gajdušek, J. AND V. Rubcov. THE MICROSTRUCTURE OF EGG MEMBRANES IN CARP, *CYPRINUS CARPIO*. *Folia Zool. (Brno)* 32(3):271-279. 1983. In English with Czech summ. SFA 29(1)
[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]
- 84-000068 Gannon, B. J.; D. J. Randall; J. Browning; R. J. G. Lester and L. J. Rogers. THE MICROVASCULAR ORGANIZATION OF THE GAS EXCHANGE ORGANS OF THE AUSTRALIAN LUNGFISH, *NEOCERATODUS FORSTERI* (KREFFT). *Aust. J. Zool.* 31(5):651-676. 1983. SFA 29(1)
[Dep. Human Morphol., Sch. Med., Flinders Univ. South Australia, Bedford Park, S. A. 5042, Australia]
- 84-000069 Geevarghese, C. and P. A. John. SOURCE AND MATURATION OF GERM CELLS IN THE TESTIS OF THE GOBLIID FISH, *OLIGOLEPIS ACUTIPENNIS* (C. & V.). *Zool. Anz.* 211(5-6):396-400. 1983. SFA 29(1)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum, India]
- 84-000070 Geffen, A. J. THE DEPOSITION OF OTOLITH RINGS IN ATLANTIC SALMON, *SALMO SALAR* L., EMBRYOS. *J. Fish Biol.* 23(4):467-474. Oct. 1983. SFA 29(1)
[Cent. Limnol., Univ. Wis., Madison 53706] Salmon embryos, age 48-81 days post-fertilization (dpf), were incubated under three different temperature and photoperiod regimes to test the effects of incubation conditions on otolith ring deposition. Otolith rings were first observed at 50 dpf and certain developmental events were marked by distinct, heavy rings. The rate of ring deposition increased with increasing temperature and exposure to light, ranging from 0.50 to 2.33 rings per day. The possible relation to physiological activity as measured by oxygen consumption is discussed.
- 84-000071 Gorbman, A. THE SEARCH FOR HAGFISH EMBRYOS--A LESSON IN ZOOLOGICAL HISTORY. *Am. Zool.* 23(4):928. 1983. Abstract only. SFA 29(1)
[Univ. Wash., Seattle] The first and only successful effort toward

MORPHOLOGY (CONTINUED)

84-000071 CONTINUED collection of hagfish embryos was by Bashford Dean in 1898 at Monterey. By chance Franz Doflein was traveling in California at this time and he bore Dean's gift of a small number of embryos to Carl von Kupffer. Unfortunately Dean never made really good use of the specimens he collected, but Kupffer published a preliminary description of head development in 1899. Apparently he did no more with this material and the crude sketches that illustrated this paper have been reproduced many times in later citations and reviews of vertebrate phylogeny. They have been and remain the only source of information concerning early organogenesis in this most primitive vertebrate. About 1925 Dean presented about 50 preserved embryos remaining in his collection to Leroy Conel of Boston University, stipulating that they be sectioned by a skillful microtechnician in the Harvard Anatomy Department and then be kept for the use of later biologists in the Anatomical Museum at Harvard. It is remarkable that many more recent efforts to duplicate Dean's success in collecting hagfish embryos have failed despite the importance and promise of evolutionary information from this key vertebrate.

84-000072 Greeley, M. S., Jr.; K. R. Marion and R. MacGregor III. GERM CELL RENEWAL IN THE TESTES OF *FUNDULUS GRANDIS*. *Am. Zool.* 23(4):1016. 1983. Abstract only. SFA 29(1)
[Univ. Ala., Birmingham]

84-000073 Hanel, L. and J. Novák. NOTE ON THE FEATHERTAIL TETRA (*ALESTOPETERSIUS INTERRUPTUS*, PISCES, CHARACIDAE). *Folia Zool. (Brno)* 32(2):179-184. 1983. In English with Czech summ. SFA 29(1)
[Dep. Syst. Zool., Charles Univ., Prague, Czechoslovakia]

84-000074 Housley, G. D. and J. C. Montgomery. CENTRAL PROJECTIONS OF VESTIBULAR AFFERENTS FROM THE HORIZONTAL SEMICIRCULAR CANAL IN THE CARPET SHARK *CEPHALOSCYLLIUM ISABELLA*. *J. Comp. Neurol.* 221(2):154-162. 1 Dec. 1983. SFA 29(1)
[Dep. Zool., Univ. Auckland, New Zealand]

84-000075 Howes, G. J. THE CRANIAL MUSCLES OF LORICARIOID CATFISHES, THEIR HOMOLOGIES AND VALUE AS TAXONOMIC CHARACTERS (TELEOSTEI: SILURIOIDEI). *Bull. Br. Mus. (Nat. Hist.)* 45(6):309-345. 27 Oct. 1983. SFA 29(1)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

84-000076 Ito, F. and H. Takahashi. ULTRASTRUCTURAL DETECTION OF SECRETORY FUNCTION OF THE PINEAL ORGAN OF THE ICE GOBY, *LEUCOPSARION PETERSI*. *Bull. Fac. Fish. Hokkaido Univ.* 34(3):169-181. Aug. 1983. SFA 29(1)
[Lab. Fresh-Water Fish-Culture, Fac. Fish., Hokkaido Univ., Hakodate, Japan]

84-000077 Ito, H. and H. Vanegas. CYTOARCHITECTURE AND ULTRASTRUCTURE OF NUCLEUS PRETHALAMICUS, WITH SPECIAL REFERENCE TO DEGENERATING AFFERENTS FROM OPTIC TECTUM AND TELEENCEPHALON, IN A TELEOST (*HOLOCENTRUS ASCENSIONIS*). *J. Comp. Neurol.* 221(4):401-415. 20 Dec. 1983. SFA 29(1)
[Dep. Anat., Osaka Univ. Med. Sch., Osaka, Japan]

MORPHOLOGY (CONTINUED)

84-000078 Iwamatsu, T. A NEW TECHNIQUE FOR DECHORIONATION AND OBSERVATIONS ON THE DEVELOPMENT OF THE NAKED EGG IN *ORYZIAS LATIPES*. *J. Exp. Zool.* 228(1):83-89. SFA 29(1)
[Dep. Biol., Aichi Univ. Educ., Kariya-shi, Aichi 448, Japan]

84-000079 Karlsson, L. GILL MORPHOLOGY IN THE ZEBRAFISH, *BRACHYDANIO RERIO* (HAMILTON-BUCHANAN). *J. Fish Biol.* 23(5):511-524. Nov. 1983. SFA 29(1)
[Swed. Univ. Agric. Sci., Fac. Vet. Med., Dep. Pathol., S-750 07 Uppsala, Sweden]

84-000080 Kaufman, L. S. FUNCTIONAL CONSTRAINTS AND PLASTICITY: CASE STUDY OF TOOTH ONTOGENY IN FISHES. *Am. Zool.* 23(4):1027. 1983. Abstract only. SFA 29(1)
[Harvard Univ., Cambridge, MA]

84-000081 Kemp, A. SKULL DEVELOPMENT AND ROOFING PATTERNS IN AUSTRALIAN CERATODONT LUNGFISH. *Am. Zool.* 23(4):1009. 1983. Abstract only. SFA 29(1)
[Queensland Mus., Australia]

84-000082 Khachaturov, V. A. THE DIGESTIVE SYSTEM OF FLYING FISHES (EXOCOETIDAE, BELONIFORMES). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):106-113. 1983. SFA 29(1)
[IOAN, Moscow, USSR]

84-000083 Khudenko, G. V.; M. Y. Kuntsova and V. V. Polenyuk. MORPHOFUNCTIONAL PECULIARITIES IN SOUND PERCEPTION OF THE EASTERN ROCKFISH, *SEBASTES TACZANOWSKII* (SCORPAENIDAE), AND THE SPANISH MACKEREL, *SCOMBER JAPONICUS* (SCOMBRIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):141-146. 1983. SFA 29(1)
[TINRO, Vladivostok, USSR] The structure of the inner ear and its sensitivity to sound was investigated in the eastern rockfish, *Sebastes taczanowskii*, and the Spanish mackerel, *Scomber japonicus*. After severance of the lateral line, sensitivity to a tone of 150 hertz decreased and increased to a tone of 800 hertz; an increase in sensitivity to the "dolphin" sound was also noted in the mackerel. Denervation to the lateral line probably increases the sensitivity of the ear to high frequency signals, making it easier for fish to find their bearings in a long-distance sound field.

84-000084 Koester, D. M. CENTRAL PROJECTIONS OF THE OCTAVOLATERALIS NERVES OF THE CLEARNOSE SKATE, *RAJA EGLANTERIA*. *J. Comp. Neurol.* 221(2):199-215. 1 Dec. 1983. SFA 29(1)
[Sch. Life Health Sci., Univ. Del., Newark 19711]

84-000085 Lauder, G. V. FUNCTIONAL AND MORPHOLOGICAL BASES OF TROPHIC SPECIALIZATION IN SUNFISHES (TELEOSTEI, CENTRARCHIDAE). *J. Morphol.* 178(1):1-21. Oct. 1983. SFA 29(1)
[Dep. Anat., Univ. Chicago, Chicago, IL 60637]

SPORT FISHERY ABSTRACTS

MORPHOLOGY (CONTINUED)

- 84-000086 Liem, K. F. and L. S. Kaufman. INTRASPECIFIC MACROEVOLUTION: FUNCTIONAL MORPHOLOGY OF A HIGHLY POLYMORPHIC CICHLID FISH. *Am. Zool.* 23(4):946. 1983. Abstract only. SFA 29(1)
[Harvard Univ., Cambridge, MA]
- 84-000087 Lombardi, J. STRUCTURE, FUNCTION, AND EVOLUTION OF TROPHOTAENIAE: PLACENTAL ANALOGUES OF VIVIPAROUS FISH EMBRYOS. *Ph.D. dissertation, Clemson Univ.* 268p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2084. Jan. 1984. SFA 29(1)
- 84-000088 Long, W. L. THE ROLE OF THE YOLK SYNCYTIAL LAYER IN DETERMINATION OF THE PLANE OF BILATERAL SYMMETRY IN THE RAINBOW TROUT, *SALMO GARDNERI* RICHARDSON. *J. Exp. Zool.* 228(1):91-97. Oct. 1983. SFA 29(1)
[Biol. Dep., West. Maryland Coll., Westminster 21157]
- 84-000089 Mähr, K.; M. Grabner; R. Hofer and H. Moser. HISTOLOGICAL AND PHYSIOLOGICAL DEVELOPMENT OF THE STOMACH IN *COREGONUS* SP. *Arch. Hydrobiol.* 98(3):344-353. 1983. SFA 29(1)
[Inst. Zool., Abt. Zoophysiol., Peter Mayr St. 1a, A-6020 Innsbruck, Austria]
- 84-000090 McCormick, C. A. CENTRAL PROJECTIONS OF INNER EAR ENDORGANS IN THE BOWFIN, *AMIA CALVA*. *Am. Zool.* 23(4):895. 1983. Abstract only. SFA 29(1)
[Georgetown Univ., Washington, DC]
- 84-000091 Meinke, D. K. and K. S. Thomson. THE DISTRIBUTION AND SIGNIFICANCE OF ENAMEL AND ENAMELOID IN THE DERMAL SKELETON OF OSTEOLEPIFORM RHIPIDISTIAN FISHES. *Paleobiology* 9(2):138-149. 1983. SFA 29(1)
[Dep. Zool., Okla. State Univ., Stillwater 74078]
- 84-000092 Montgomery, J. C. and G. D. Housley. THE ABDUCENS NUCLEUS IN THE CARPET SHARK *CEPHALOSCYLLIUM ISABELLA*. *J. Comp. Neurol.* 221(2):163-168. 1 Dec. 1983. SFA 29(1)
[Dep. Zool., Univ. Auckland, New Zealand]
- 84-000093 Morris, S. L. and A. J. Gaudin. OSTEOCRANIAL DEVELOPMENT IN THE VIVIPAROUS SURFPERCH *AMPHISTICHUS ARGENTEUS* (PISCES: EMBIOTOCIDAE). *J. Morphol.* 174(1):95-120. Oct. 1982. SFA 29(1)
[Dep. Biol., Calif. State Univ., Northridge 91330]
- 84-000094 Moser, H. G.; D. A. Ambrose; M. S. Busby; J. L. Butler; E. M. Sandknop; B. Y. Sumida and E. G. Stevens. DESCRIPTION OF EARLY STAGES OF WHITE SEABASS, *ATRACTOSCION NOBILIS*, WITH NOTES ON DISTRIBUTION. *Calif. Coop. Oceanic Fish. Invest.* 24:182-193. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] Eggs, larvae, and juveniles of *Atractoscion nobilis*, reared in the laboratory, are described and compared with those of *Cynoscion* species. Eggs of *A. nobilis* are among the largest reported for a sciaenid species

MORPHOLOGY (CONTINUED)

84-000094 CONTINUED (1.24-1.32 mm in diameter), and the larvae have a distinctive morphology and pigment pattern that contrasts sharply with that of *Cynoscion* species. The larvae are robust, with long pectoral and pelvic fins and have a solid pigment sheath of melanophores and xanthophores that initially covers the head and trunk and expands to cover the body completely. The only other sciaenid with similar developmental stages is *Sciaena umbra* of the eastern Atlantic, Mediterranean, and Black Sea. Late-stage larvae of *Larimus fasciatus* of the western Atlantic have large, heavily pigmented paired fins, but the body pigment is not a solid cloak as in *A. nobilis*. *Atractoscion* larvae occurred in only 104 samples of all CalCOFI collections made between 1950 and 1978. Larvae occurred from Santa Rosa Island, California, to Santa Maria Bay, Baja California, with highest concentrations in the Sebastian Viscaïno Bay and San Juanico Bay regions. Most of the larvae occurred from May to August, with a peak in July.

84-000095 Moshkov, D. A.; L. N. Muzafarova; L. A. Kashapova and V. D. Levadnyi. A STUDY OF MAUTHNER NEURON STRUCTURE DURING GOLDFISH ONTOGENY. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 11(5):318-323. July 1981. SFA 29(1)

[Inst. Biol. Physics, Acad. Sci. USSR, Pushchino, USSR]

84-000096 Nikiforov, S. N.; S. N. Safronov and N. S. Fadeev. DISTINGUISHING CHARACTERS OF ROCK SOLE, *LEPIDOPSETTA BILINEATA*, AND MOCHIGAR SOLE, *L. MOCHIGAREI* (PLEURONECTIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):36-44. 1983. SFA 29(1)

[TINRO, Vladivostok, USSR]

84-000097 Reimchen, T. E. STRUCTURAL RELATIONSHIPS BETWEEN SPINES AND LATERAL PLATES IN THREESPINE STICKLEBACK (*GASTEROSTEUS ACULEATUS*). *Evolution* 37(5):931-946. Sept. 1983. SFA 29(1)

[Drizzle Lake Ecol. Reserve, Box 297, Port Clements, BC V0T 1R0, Canada]

84-000098 Richman, N. H.; S. Tai de Diaz; R. S. Nishioka and H. A. Bern. COHO SALMON GILL MORPHOLOGY DURING SMOLTIFICATION. *Am. Zool.* 23(4):1014. 1983. Abstract only. SFA 29(1)

[Univ. Calif., Berkeley]

84-000099 Rowland, W. J. COLOR INTENSITY AS A PREDICTOR OF RESPONSIVENESS IN MALE THREESPINE STICKLEBACKS. *Am. Zool.* 23(4):880. 1983. Abstract only. SFA 29(1)

[Indiana Univ., Bloomington]

84-000100 Safer, A. M. A.; P. Tytler and N. El-Sayed. THE STRUCTURE OF THE HEAD KIDNEY IN THE MUDSKIPPER, *PERIOPHTHALMUS KOELREUTERI* (PALLAS). *J. Morphol.* 174(1):121-131. Oct. 1982. SFA 29(1)

[Dep. Zool., Fac. Sci., Univ. Kuwait, Kuwait, Kuwait]

84-000101 Saidel, W. M. and A. N. Popper. SPATIAL ORGANIZATION IN THE SACCULE AND LAGENA OF A TELEOST: HAIR CELL PATTERN AND INNERVATION. *J. Morphol.* 177(3):301-317. Sept. 1983. SFA 29(1)

[Dep. Anat., Sch. Med., Georgetown Univ., Washington, DC 20007]

MORPHOLOGY (CONTINUED)

84-000102 Savage, A. G. THE ULTRASTRUCTURE OF THE BLOOD CELLS OF THE PIKE *ESOX LUCIUS* L. *J. Morphol.* 178(2):187-206. Nov. 1982. SFA 29(1)
[Dep. Zool., Univ. Coll., Cork, Ireland]

84-000103 Sidon, E. W. and J. H. Youson. MORPHOLOGICAL CHANGES IN THE LIVER OF THE SEA LAMPREY, *PETROMYZON MARINUS* L., DURING METAMORPHOSIS. II. CANALICULAR DEGENERATION AND TRANSFORMATION OF THE HEPATOCYTES. *J. Morphol.* 178(3):225-246. Dec. 1983. SFA 29(1)
[J.H. Youson: Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

84-000104 Silverman, R.; M. P. Schreibman and C. L. Forest. A SCANNING ELECTRON MICROSCOPE STUDY OF THE OLFACTORY EPITHELIUM IN MATURE AND AGING PLATYFISH (*XIPHOPHORUS MACULATUS*). *Am. Zool.* 23(4):926. 1983. Abstract only. SFA 29(1)
[Dep. Biol., Brooklyn Coll., Brooklyn, NY]

84-000105 Soin, S. G. A NEW CLASSIFICATION OF THE STRUCTURE OF MATURE EGGS OF FISHES ACCORDING TO THE RATIO OF YOLK TO OOPLASM. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 12(1):13-17. Nov. 1981. SFA 29(1)
[Moscow State Univ., Moscow, USSR]

84-000106 Stehr, C. M. and J. W. Hawkes. THE DEVELOPMENT OF THE HEXAGONALLY STRUCTURED EGG ENVELOPE OF THE C-O SOLE (*PLEURONICHTHYS COENOSUS*). *J. Morphol.* 178(3):267-284. Dec. 1983. SFA 29(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-000107 Trinkaus, J. P. and C. A. Erickson. PROTUSIVE ACTIVITY, MODE AND RATE OF LOCOMOTION, AND PATTERN OF ADHESION OF *FUNDULUS* DEEP CELLS DURING GASTRULATION. *J. Exp. Zool.* 228(1):41-70. Oct. 1983. SFA 29(1)
[Dep. Biol., Yale Univ., New Haven, CT 06520]

84-000108 Voytovich, N. V. and V. V. Voytovich. MORPHOMETRIC DESCRIPTION OF PIZHYAN, *COREGONUS LAVARETUS PIDSCHIAN* (COREGONIDAE), FROM THE TALOVKA RIVER (KAMCHATKA). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):161-164. 1983. SFA 29(1)
[Dir. Conserv. Reprod. Fish Reserves Regul. Fish Exploitation, Petropavlovsk-Kamchatskii, USSR]

84-000109 Whitear, M. and E. B. Lane. MULTIVILLOUS CELLS: EPIDERMAL SENSORY CELLS OF UNKNOWN FUNCTION IN LAMPREY SKIN. *J. Zool. (Lond.)* 201(2):259-272. Oct. 1983. SFA 29(1)
[Univ. Coll., Gower St., London WC1E 6BT, England]

PHYSIOLOGY

84-000110 Pärt, P. and R. A. C. Lock. DIFFUSION OF CALCIUM, CADMIUM AND MERCURY IN A MUCOUS SOLUTION FROM RAINBOW TROUT. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):259-263. 1983. SFA 29(1)
[Inst. Zoophysiol., Univ. Uppsala, Box 560, S-751 22 Uppsala, Sweden]

PHYSIOLOGY (CONTINUED)

84-000111 Castrén, M. and A. Oikari. OPTIMAL ASSAY CONDITIONS FOR LIVER UDP-GLUCURONOSYLTRANSFERASE FROM THE RAINBOW TROUT, *SALMO GAIIRDNERI*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):365-369. 1983. SFA 29(1)

[A. Aikari: [Dep. Zool., Univ. Helsinki, Arkadiankatu 7, SF-00100, Helsinki 10, Finland]

84-000112 Abdun-Nur, D.; C. S. Marcus and F. E. Russell. PERICARDITIS ASSOCIATED WITH SCORPIONFISH (*SCORPAENA GUTTATA*) STING. *Toxicon* 19(4):579-581. SFA 29(1)

[F. E. Russell: Dep. Pharmacol. Toxicol., Coll. Pharm., Univ. Ariz., Tucson 85721]

84-000113 Adcock, P. J. and P. R. Dando. WHITE MUSCLE LACTATE AND PYRUVATE CONCENTRATIONS IN RESTED FLOUNDER, *PLATICHTHYS FLESUS* AND PLAICE, *PLEURONECTES PLATESSA*: A RE-EVALUATION OF HANDLING AND SAMPLING TECHNIQUES. *J. Mar. Biol. Assoc. U.K.* 63(4):897-903. Nov. 1983. SFA 29(1)

[P. R. Dando: The Lab., Mar. Biol. Assoc., Citadel Hill, Plymouth PL1 2PB, England]

84-000114 Ahmad, T.; N. A. Slaman and N. A. Hussain. EFFECTS OF SOME EXPERIMENTAL CONDITIONS ON THE BEHAVIOUR AND SURVIVAL OF *LIZA ABU* (HECKEL) FROM BASRAH, IRAQ. *J. Fac. Mar. Sci. (Jeddah)* 3:111-118. 1983. In English with Arabic summ. SFA 29(1)

[Dep. Fish. Mar. Resour., Coll. Agric., Univ. Basrah, Iraq] *Liza abu* (Heckel) were collected from Basrah University fish farm and subjected to range of temperatures, salinities and different pH media. The results show that this species can tolerate water temperature up to 39°C for 24 h. However, these fishes can survive at a salinity of 10 PPT for 24 H, and with a minor mortality at salinity of 15 PPT. Strong acidic media (Below pH 4.0) are lethal to the animals.

84-000115 Alekseev, F. E. HERMAPHRODITISM IN PORGIES (PERCIFORMES, SPARIDAE). II. SEXUAL STRUCTURE OF THE POPULATIONS, MECHANISM OF ITS FORMATION AND EVOLUTION IN SCUPS, *PAGRUS PAGRUS*, *P. ORPHUS*, *P. EHRENBERGI*, AND *P. AURIGA*. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):61-73. 1983. SFA 29(1)

[AtlantNIRO, Kaliningrad, USSR]

84-000116 Andreyeva, A. M. OOGENESIS OF THE RYBINSK RESERVOIR BREAM, *ABRAMIS BRAMA* (CYRPINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):74-78. 1983. SFA 29(1)

[Inst. Biol. Inland Waters, USSR Acad. Sci., Borok, Yaroslavl Prov., USSR]

84-000117 Baker, B. I. and J. C. Buckingham. A STUDY OF CORTICOTROPHIC AND MELANOTROPHIC ACTIVITIES IN THE PITUITARY AND BRAIN OF THE LAMPREY *LAMPETRA FLUVIATILIS*. *Gen. Comp. Endocrinol.* 52(2):284-290. Nov. 1983. SFA 29(1)

[Sch. Biol. Sci., Bath Univ., Bath BA2 7AY, England]

84-000118 Becker, C. D.; D. A. Neitzel and C. S. Abernethy. EFFECTS OF DEWATERING ON CHINOOK SALMON REDDS: TOLERANCE OF FOUR DEVELOPMENT PHASES TO ONE-TIME DEWATERING. *N. Am. J. Fish. Manage.* 3(4):373-382. 1983. SFA

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000118 CONTINUED 29(1)
[Environ. Sci. Dep., Pac. Northwest Lab., Richland, WA 99352]
- 84-000119 Biddiscombe, S. and D. R. Idler. PLASMA LEVELS OF THYROID HORMONES IN SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) DECREASE BEFORE SPAWNING. *Gen. Comp. Endocrinol.* 52(3):467-470. Dec. 1983. SFA 29(1)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's NF A1C 5S7, Canada]
- 84-000120 Block, B. A. BRAIN HEATERS IN THE BILLFISH. *Am. Zool.* 23(4):936. 1983. Abstract only. SFA 29(1)
[Duke Univ., Durham, NC 27706]
- 84-000121 Boord, R. L. and R. G. Northcutt. DIENCEPHALIC AND MESENCEPHALIC ELECTROSENSORY CENTERS OF THE CLEARNOSE SKATE. *Am. Zool.* 23(4):927. 1983. Abstract only. SFA 29(1)
[Univ. Del., Newark]
- 84-000122 Boyd, R. B. and A. L. DeVries. THE SEASONAL DISTRIBUTION OF ANIONIC BINDING SITES IN THE BASEMENT MEMBRANE OF THE KIDNEY GLOMERULUS OF THE WINTER FLOUNDER *PSEUDOPLEURONCTES AMERICANUS*. *Cell Tissue Res.* 234(2):271-277. Oct. 1983. SFA 29(1)
[Dep. Anat., Pa. Coll. Podiatric Med., 8th at Race St., Philadelphia, PA 19107]
- 84-000123 Bozhkova, V. P.; L. R. Pal'mbakh; V. Y. Khariton and L. M. Chailakhyan. ADHESIVE PROPERTIES AND SURFACE RELIEF OF CLEAVAGE FURROWS IN LOACH EMBRYOS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 13(5):284-292. July 1983. SFA 29(1)
[Inst. Problems Inf. Transmission, Acad. Sci. USSR, Moscow, USSR]
- 84-000124 Bozhkova, V. P.; T. V. Potapova and L. M. Chailakhyan. STUDY OF INTERCELLULAR EXCHANGE IN LOACH EMBRYOS BY INJECTIONS WITH FLUORESCENT DYES. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 11(6):363-369. Sept. 1981. SFA 29(1)
[Inst. Problems Inf. Transmission, Acad. Sci. USSR, Moscow State Univ., Moscow, USSR]
- 84-000125 Bulger, A. J. and S. C. Tremaine. MAGNITUDE OF SEASONAL EFFECTS ON HEAT TOLERANCE IN *FUNDULUS HETEROCLITUS*. *Am. Zool.* 23(4):911. 1983. Abstract only. SFA 29(1)
[Univ. Va., Charlottesville]
- 84-000126 Burke, M. and J. F. Leatherland. SEASONAL CHANGES IN SERUM THYROID HORMONE LEVELS OF THE FERAL BROWN BULLHEAD, *ICTALURUS NEBULOSUS* LESUEUR. *J. Fish Biol.* 23(5):585-593. Nov. 1983. SFA 29(1)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000127 Cameron, A. M. and R. J. Lewis. THE ANTISPASMOGENIC ACTION ON GUINEA-PIG ILEUM OF A FRACTION OBTAINED FROM THE TOXIC SKIN SECRETION OF THE STONEFISH, *SYNANCEIA TRACHYNIS*. *Toxicon* 20(6):991-1000. 1982. SFA 29(1)
[Dep. Zool., Univ. Queensland, St. Lucia, Brisbane 4067, Australia]
- 84-000128 Cameron, A. M.; J. Surridge; W. Stablum and R. J. Lewis. A CRINOTOXIN FROM THE SKIN TUBERCLE GLANDS OF A STONEFISH (*SYNANCEIA TRACHYNIS*). *Toxicon* 19(1):159-170. 1981. SFA 29(1)
[Dep. Zool., Univ. Queensland, St. Lucia, Brisbane 4067, Australia]
- 84-000129 Cassidy, S. FAILURE OF PLATYFISH, *XIPHOPHORUS MACULATUS*, TO ADAPT TO CALCIUM-DEFICIENT DILUTE ARTIFICIAL SEA WATER. *Am. Zool.* 23(4):995. 1983. Abstract only. SFA 29(1)
[Southampton Coll., NY]
- 84-000130 Chang, J. P. and R. E. Peter. EFFECTS OF PIMOZIDE AND DES GLY¹, [D-ALA⁶] LUTEINIZING HORMONE-RELEASING HORMONE ETHYLAMIDE ON SERUM GONADOTROPIN CONCENTRATIONS, GERMINAL VESICLE MIGRATION, AND OVULATION IN FEMALE GOLDFISH, *CARASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 52(1):30-37. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]
- 84-000131 Colville, T. P.; R. H. Richards and J. W. Dobbie. VARIATIONS IN RENAL CORPUSCULAR MORPHOLOGY WITH ADAPTATION TO SEA WATER IN THE RAINBOW TROUT, *SALMO GAIIRDNERI* RICHARDSON. *J. Fish Biol.* 23(4):451-456. Oct. 1983. SFA 29(1)
[Dep. Vet. Sci., N. Dak. State Univ., Fargo 58105] The kidneys of similar sized rainbow trout from freshwater and seawater environments were examined and several parameters of renal corpuscular morphology were measured. The glomeruli of the seawater trout were significantly smaller and contained significantly fewer red blood cells than those of the freshwater fish. There was also some evidence of a decreased number of renal corpuscles per unit area, and an increased proportion with no apparent capsular space in the seawater trout.
- 84-000132 Corazza, L. and J. G. Nickum. RATE OF FOOD PASSAGE THROUGH THE GASTROINTESTINAL TRACT OF FINGERLING WALLEYES. *Prog. Fish-Cult.* 45(3):183-184. July 1983. SFA 29(1)
[Title XII Program, Univ. Del., Newark 19711]
- 84-000133 Craig, T.; A. Blaber and F. R. Hallett. MOTILITY OF THE SPERMATOOZOA OF RAINBOW TROUT, *SALMO GAIIRDNERI*, IN SOLUTIONS OF VARIOUS SALINITIES AS STUDIED BY QUASI-ELASTIC LIGHT SCATTERING. *Biol. Reprod.* 29(5):1189-1193. Dec. 1983. SFA 29(2)
[Physics Dep., Univ. Guelph, Guelph, ON N1G 2W1, Canada]
- 84-000134 Cserr, H. F.; M. W. B. Bradbury; K. Mackie and E. J. Moody. CONTROL OF EXTRACELLULAR IONS IN SKATE BRAIN DURING OSMOTIC DISTURBANCES. *Am. J. Physiol.* 245(6):R853-R859. Dec. 1983. SFA 29(1)
[Sect. Physiol. Biophys., Brown Univ., Providence, RI 02912]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

84-000135 Curtis, L. R. GLUCURONIDATION AND BILIARY EXCRETION OF PHENOLPHTHALEIN IN TEMPERATURE-ACCLIMATED STEELHEAD TROUT (*SALMO GAIARDNERI*). *Comp. Biochem. Physiol. C. Comp. Pharmacol. Toxicol.* 76(1):107-111. 1983. SFA 29(1)

[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

84-000136 De Silva, S. S. and M. K. Perera. DIGESTIBILITY OF AN AQUATIC MACROPHYTE BY THE CICHLID *ETROPLUS SURATENSIS* (BLOCH) WITH OBSERVATIONS ON THE RELATIVE MERITS OF THREE INDIGENOUS COMPONENTS AS MARKERS AND DAILY CHANGES IN PROTEIN DIGESTIBILITY. *J. Fish Biol.* 23(6):675-684. Dec. 1983. SFA 29(1)

[Dep. Zool., Ruhuna Univ. Coll., Matara, Sri Lanka] The digestibility of the aquatic macrophyte *Hydrilla verticellata* by the Asian cichlid, *Etroplus suratensis* was estimated using three indigenous markers viz. hydrolysis resistant organic matter (HROM), crude fibre (CF) and hydrolysis resistant ash (HRA). In the fodder HROM showed the least variation and HRA the highest. The recovery of HRA in the faeces was always higher than 100% whereas HROM was the nearest to 100%. The total digestibility varied between 34.6% and 51.9%, and the digestibility estimates were higher when HRA was considered as the marker. The overall protein and lipid digestibility varied between 59.2%-70.9% and 65.0%-70.1% respectively. It is suggested that HROM is a better reference marker in comparison CF and HRA. Daily variation in protein digestibility ranged from 51.2% to 81.8%.

84-000137 DeManno, D. A. THE *IN VITRO* EFFECTS OF PHOSPHODIESTERASE INHIBITORS ON STEROID INDUCED FINAL MATURATION IN YELLOW PERCH (*PERCA FLAVESCENS*) AND BROOK TROUT (*SALVELINUS FONTINALIS*) OOCYTES. *Am. Zool.* 23(4):973. 1983. Abstract only. SFA 29(1)

[Univ. Notre Dame, Notre Dame, IN 46556]

84-000138 Desrochers, P. E. and J. R. Hoffert. SUPEROXIDE DISMUTASE PROVIDES PROTECTION AGAINST THE HYPEROXIA IN THE RETINA OF THE RAINBOW TROUT (*SALMO GAIARDNERI*). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):241-247. 1983. SFA 29(1)

[Dep. Physiol., Mich. State Univ., East Lansing 48824-1101]

84-000139 Dettlaff, T. A.; P. E. Feulgenhauer; A. S. Stepanov and E. V. Chulitskaya. PROTEIN SYNTHESIS IN THE OOCYTES OF THE STELLATE STURGEON AT DIFFERENT STAGES OF MATURATION AND EFFECT OF ITS INHIBITION ON CHANGES IN THE OOCYTES. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 11(1):17-22. Nov. 1980. SFA 29(1)

[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]

84-000140 Does, R. M.; T. E. Finger and M. R. Gold. IMMUNOHISTOCHEMICAL LOCALIZATION OF ENKEPHALIN- AND ACTH-RELATED SUBSTANCES IN THE PITUITARY OF THE LAMPREY. *Cell Tissue Res.* 235(1):107-115. Jan. 1984. SFA 29(1)

[Univ. Mich. Sch. Med., Mental Health Res. Inst., 205 Washtenaw Pl., Ann Arbor 48109]

84-000141 Dorosheva, M. G. THE PHYSIOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF FEMALES OF THE STURGEON, *ACIPENSER GUELLENSTAEDTI*, AND THE SEVRYUGA, *A. STELLATUS* (ACIPENSERIDAE), CAUGHT IN THE GULF OF

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

84-000141 CONTINUED TAGANROG DURING THE PERIOD OF THE SPRING MIGRATION. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):123-128. 1983. SFA 29(1)
[AzNIIRKh, Rostov-on-Don, USSR]

84-000142 Dufour, S.; N. Delerue-Le Belle and Y. Fontaine. EFFECTS OF STEROID HORMONES ON PITUITARY IMMUNOREACTIVE GONADOTROPIN IN EUROPEAN FRESHWATER EEL, *ANGUILLA ANGUILLA* L. *Gen. Comp. Endocrinol.* 52(2):190-197. Nov. 1983. SFA 29(1)
[Lab. Physiol. Gen. Comp., Mus. Natl. Hist. Nat., 7 rue Cuvier, 75231 Paris Cedex 05, France]

84-000143 Dunn, J. F.; P. W. Hochachka; W. Davison and M. Guppy. METABOLIC ADJUSTMENTS TO DIVING AND RECOVERY IN THE AFRICAN LUNGFISH. *Am. J. Physiol.* 245(5):R651-R657. Nov. 1983. SFA 29(1)
[Dep. Physiol., Sch. Vet. Med., Univ. Nairobi, Nairobi, Kenya]

84-000144 Emmerson, W. D. and W. Strydom. AN ELECTRONIC CONTROLLER FOR THE AUTOMATIC DETERMINATION OF OXYGEN CONSUMPTION IN AQUATIC ANIMALS. *Aquaculture* 36(1-2):173-177. 1 Jan. 1984. SFA 29(1)
[Dep. Zool., Univ. Port Elizabeth, Port Elizabeth 6000, South Africa]

84-000145 Fisher, A. W. F.; K. Wong; V. Gill and K. Lederis. IMMUNOCYTOCHEMICAL LOCALIZATION OF UROTENSIN I NEURONS IN THE CAUDAL NEUROSECRETORY SYSTEM OF THE WHITE SUCKER (*CATOSTOMUS COMMERSONI*). *Cell Tissue Res.* 235(1):19-23. Jan. 1984. SFA 29(1)
[Dep. Anat. Pharmacol. Therapeut., Univ. Calgary, Alberta, BC, Canada]

84-000146 Focant, B.; F. Huriaux and P. Vandewalle. ELECTROPHORETIC DIFFERENTIATION OF THE FIBRE TYPES OF ADDUCTOR MANDIBULAE, STERNOHYOIDEUS AND PROTRACTOR HYOIDEUS MUSCLES OF THE CARP (*CYPRINUS CARPIO* L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):283-289. 1983. SFA 29(1)
[Univ. Liège, Lab. Biochim. Musculaire, Inst. Chim. B6, Sart Tilman, B-4000 Liège, Belgium]

84-000147 Fossum, P. DIGESTION RATE OF FOOD PARTICLES IN THE GUT OF LARVAL HERRING (*CLUPEA HARENGUS* L.). *Fiskeridir. Skr. Ser. Havunders.* 17(9):347-357. 1983. SFA 29(1)
[Inst. Mar. Res., Bergen, Norway]

84-000148 French, C. J.; P. W. Hochachka and T. P. Mommsen. METABOLIC ORGANIZATION OF LIVER DURING SPAWNING MIGRATION OF SOCKEYE SALMON. *Am. J. Physiol.* 245(6):R827-R830. Dec. 1983. SFA 29(1)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 2A9, Canada]

84-000149 Gasser, K. W. and L. B. Kirschner. AMINO ACID INHIBITION OF INTESTINAL ALKALINE PHOSPHATASE IN THE RAINBOW TROUT. *Am. Zool.* 23(4):1012. 1983. Abstract only. SFA 29(1)
[Wash. State Univ., Pullman]

84-000150 Gershanovich, A. D. EFFECTS OF TEMPERATURE ON METABOLISM, GROWTH, AND FOOD REQUIREMENT OF YOUNG BELUGA, *HUSO HUSO*, AND SHEAP STURGEON, *ACIPENSER NUDIVENTRIS* (ACIPENSERIDAE). *J. Ichthyol. (Engl.)*

PHYSIOLOGY (CONTINUED)

84-000150 CONTINUED *Transl. Vopr. Ikhtiolo.* 23(2):55-60. 1983. SFA 29(1)
[VNIRO, Moscow, USSR] Metabolism, growth, and food requirement of young beluga, *Huso huso*, and sheep sturgeon, *Acipenser nudiiventris*, under different temperature regimes were studied. Metabolism of both the species is two-fold greater at 24°C than at 12°C. Zones of relative independence of normal metabolism from temperature were identified. The daily growth rate and food requirement increased with rise in temperature. An increased ration for young beluga leads to a greater increase in metabolism and more rapid growth than was found for the sheep sturgeon. The most efficient growth of beluga was at 20°C, and that of sheep sturgeon at 24°C. The optimum temperature for growth corresponds to the upper limit of the range of relative independence of the standard metabolism in relation to temperature.

84-000151 Gonzalez, I. and D. A. Powers. THE NADP-DEPENDENT ISOCITRATE DEHYDROGENASE ISOZYMES OF *FUNDULUS HETEROCLITUS* (L.). *Am. Zool.* 23(4):910. 1983. Abstract only. SFA 29(1)
[Johns Hopkins Univ., Baltimore, MD]

84-000152 Goswami, S. V.; I. Parwez and B. I. Sundararaj. SOME ASPECTS OF OSMOREGULATION IN A STENOHALINE FRESHWATER CATFISH, *HETEROPNEUSTES FOSSILIS* (BLOCH), IN DIFFERENT SALINITIES. *J. Fish Biol.* 23(4):475-487. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Delhi, Delhi 110007, India]

84-000153 Grau, E. G.; P. Prunet; T. Gross; R. S. Nishioka and H. A. Bern. BIOASSAY FOR SALMON PROLACTIN USING HYPOPHYSECTOMIZED *FUNDULUS HETEROCLITUS*. *Gen. Comp. Endocrinol.* 53(1):78-85. Jan. 1984. SFA 29(1)
[Dep. Zool., Univ. Hawaii at Manoa, Honolulu 96822]

84-000154 Grau, E. G.; R. S. Nishioka; G. Young and H. A. Bern. SOMATOSTATIN-LIKE IMMUNOFLUORESCENCE IN THE HYPOTHALAMUS AND PITUITARY OF SEVERAL TELEOST FISH. *Am. Zool.* 23(4):883. 1983. Abstract only. SFA 29(1)
[Univ. Hawaii, Honolulu]

84-000155 Grove, B. D. and J. P. Wourms. THE ROLE OF THE FOLLICLE IN MATERNAL-EMBRYONIC NUTRIENT EXCHANGE IN THE VIVIPAROUS FISH, *HETERANDRIA FORMOSA*. *Am. Zool.* 23(4):1017. 1983. Abstract only. SFA 29(1)
[Clemson Univ., Clemson, SC]

84-000156 Habibi, H. R. and B. W. Ince. EFFECTS OF STEROIDS AND SEX REVERSAL ON INTESTINAL ABSORPTION OF L-[¹⁴C]LEUCINE *IN VIVO*, IN RAINBOW TROUT, *SALMO GAIRDNERI*. *Gen. Comp. Endocrinol.* 52(3):438-444. Dec. 1983. SFA 29(1)
[B. W. Ince: Dep. Biol. Sci., Univ. Aston, Gosta Green, Birmingham B4 7ET, England]

84-000157 Halpern-Sebold, L. R.; M. P. Schreibman; H. Margolis-Kazan and H. J. T. Goos. A RELATIONSHIP BETWEEN THE NUMBER OF LUTEINIZING HORMONE RELEASING HORMONE (LHRH) CONTAINING NEURONS AND GONADOTROPS IN PLATYFISH. *Am. Zool.* 23(4):882. 1983. Abstract only. SFA 29(1)
[Biol. Dep., Brooklyn Coll., Brooklyn, NY]

PHYSIOLOGY (CONTINUED)

84-000158 Hamada, A. and W. Maeda. OXYGEN UPTAKE DUE TO SPECIFIC DYNAMIC ACTION OF THE CARP, *CYPRINUS CARPIO*. *Jpn. J. Limnol.* 44(3):225-239. July 1983. SFA 29(1)

[Dep. Fish., Government Ibaraki Pref., Sannomaru, Mito, 310 Japan]

84-000159 Hamada, A.; W. Maeda; J. Iwasaki and A. Kumamaru. CONVERSION EFFICIENCY OF PHYTOPLANKTON IN THE GROWTH OF SILVER CARP, *HYPOPTHALMICHTHYS MOLITRIX*. *Jpn. J. Limnol.* 44(4):321-328. Oct. 1983. SFA 29(1)

[Fish. Dep., Gov. Ibaraki Pref., Mito 300, Japan] Two experiments were carried out to estimate the gross efficiency and the conversion efficiency of phytoplankton in the growth of silver carp, *Hypophthalmichthys molitrix*. One involved the determination of the growth rates of silver carp at each respective bloom of different algal species in Lake Kasumigaura, and the other, the estimation of food intake by silver carp. The results showed the gross efficiency figures of 15% for *Anabaena*, 11% for diatoms and 1.5% for *Microcystis*. Considering the digestive efficiency, the conversion efficiency figures of 19% were obtained for diatoms and 4.5% for *Microcystis*.

84-000160 Hamlett, W. C., Jr. MATERNAL-FETAL RELATIONS IN ELASMOBRANCH FISHES. *Ph.D. dissertation, Clemson Univ.* 244p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1744. Dec. 1983. SFA 29(1)

84-000161 Harrington, J. P. DIFFERENTIAL EFFECTS OF MONOVALENT CATIONS AND ALKANOLS ON THE THERMAL DENATURATION OF SOCKEYE AND COHO HEMOGLOBINS. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):235-240. 1983. SFA 29(1)

[Dep. Chem., Univ. Alaska, Anchorage 99508]

84-000162 Haschemeyer, A. E. V. and H. W. Jannasch. ANTIFREEZE GLYCOPEPTIDES OF ANTARCTIC FISHES. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(3):545-548. 1983. SFA 29(1)

[Inst. Jacques Monod, Univ. Paris VI, 2 Place Jussieu, Paris V, France]

84-000163 Hayashi, K. COMPONENT GLYCERYL ETHERS IN LIVER LIPIDS OF SPINY DOGFISH AND JAPANESE CAT SHARK. *Bull. Fac. Fish. Hokkaido Univ.* 34(3):250-259. Aug. 1983. SFA 29(1)

[Training Factory, Dep. Chem., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

84-000164 Hermann, J. EXPERIMENTELLE UNTERSUCHUNGEN ZUR FILTRATIONSLEISTUNG UND ZUM ENERGIEHAUSHALT JUNGER SILBERKARPFEN (*HYPOPTHALMICHTHYS MOLITRIX* VAL.). [EXPERIMENTAL STUDIES ON THE FILTRATION EFFICIENCY AND THE ENERGY BALANCE OF YOUNG SILVER CARP (*HYPOPTHALMICHTHYS MOLITRIX* VAL.).] *Arch. Hydrobiol. Supplementb.* 65(2-3):268-299. 1983. In German with English summ. SFA 29(1)

[Inst. Meereskunde, Abt. Fischereibiologie, Düsternbrooker Weg 20, D-2300 Kiel, West Germany] The ingestion of algae by young silver carp (0.3-2.4 g) was measured with a fluorometer in the laboratory at 20°C. The green algae *Chlamydomonas noctigama* (15 µm) was chosen as the food organism. During 24 hours the silver carp ingested 2-3% of its own body weight as algal dry weight when the concentration was higher than 30 mg dry weight·l⁻¹. Field experiments in net cages showed that it took 3 hours for the intestine to be filled at 22-24°C. The daily ration of algae (dry weight) was estimated to be 4-6% of the body weight. Measurements of oxygen consumption were used to estimate the magnitude of metabolism. The oxygen consumption of young silver carp at 20°C amounted to 0.306 mg O₂·h⁻¹·g⁻¹ of fish. With decreasing

PHYSIOLOGY (CONTINUED)

- 84-000164 CONTINUED temperature the oxygen consumption declines rapidly. It was assumed that this value is an appropriate estimate for the routine metabolism. The food utilization was determined by the decrease in the percentage of the organic matter in the algae and in the faeces following Conover's method. The degree of utilization decreased with the increasing algal concentration. At an algal density of 30 mg dry weight $\cdot l^{-1}$ the utilization was between 60 and 80 percent. From the results of the oxygen consumption measurements a daily minimum energy requirement of 100 Joule $\cdot g^{-1}$ of fish was estimated. Model calculations showed that the silver carp has to consume 2.5% of its own body weight as algal dry weight to obtain a positive energy balance.
- 84-000165 Hirano, T. and M. Suyama. [FATTY ACID COMPOSITION AND ITS SEASONAL VARIATION OF LIPIDS OF WILD AND CULTURED AYU.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1459-1464. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]
- 84-000166 Hirose, K.; Y. Nagahama; S. Adachi and K. Wakabayashi. CHANGES IN SERUM CONCENTRATIONS OF GONADOTROPIN, 17α -HYDROXY-PROGESTERONE AND 17α , 20β -DIHYDROXY-4-PREGNEN-3-ONE DURING SYNTHETIC LH-RH-INDUCED FINAL OOCYTE MATURATION AND OVULATION IN THE AYU *PLECOGLOSSUS ALTIVELIS*. *Bull. Jpn. Soc. Sci. Fish.* 49(8):1165-1169. Aug. 1983. SFA 29(1)
[Arasaki Mar. Biol. Stn., Tokai Reg. Fish. Res. Lab., Arasaki, Nagai, Yokosuka 238-03 Japan]
- 84-000167 Hjelmeland, K. PROTEINASE INHIBITORS IN THE MUSCLE AND SERUM OF COD (*GADUS MORHUA*). ISOLATION AND CHARACTERIZATION. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):365-372. 1983. SFA 29(1)
[Inst. Fish., Univ. Tromsø, N-9000 Tromsø, Norway]
- 84-000168 Hofsten, A. v.; D. Kahan; R. Katznelson and T. Bar-El. DIGESTION OF FREE-LIVING NEMATODES FED TO FISH. *J. Fish Biol.* 23(4):419-428. Oct. 1983. SFA 29(1)
[Inst. Physiol. Bot., Univ. Uppsala, Uppsala, Sweden]
- 84-000169 Holdway, D. A. THE EFFECT OF GROWTH RATE ON THE PROXIMATE COMPOSITION AND MATURATION OF ATLANTIC COD (*GADUS MORHUA*). *Ph.D. dissertation, Univ. Guelph (Canada)* 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1745. Dec. 1983. SFA 29(1)
- 84-000170 Holstein, B. EFFECT OF VASOACTIVE INTESTINAL POLYPEPTIDE ON GASTRIC ACID SECRETION AND MUCOSAL BLOOD FLOW IN THE ATLANTIC COD, *GADUS MORHUA*. *Gen. Comp. Endocrinol.* 52(3):471-473. Dec. 1983. SFA 29(1)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]
- 84-000171 Hontela, A. and R. E. Peter. ENTRAINMENT OF DAILY SERUM GONADOTROPIN CYCLES IN THE GOLDFISH TO PHOTOPERIOD, FEEDING, AND DAILY THERMOCYCLES. *J. Exp. Zool.* 228(1):129-134. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000172 Howell, W. M. and D. E. Butts. SILVER STAINING OF SPERMATOZOA FROM LIVING AND PRESERVED MUSEUM FISHES: A NEW TAXONOMIC APPROACH. *Copeia* 1983(4):974-978. 14 Dec. 1983. SFA 29(1)
[Samford Univ., Birmingham, AL 35229]
- 84-000173 Hung, S. S. O.; B. L. Walker and S. J. Slinger. EFFECT OF OXIDIZED OIL ON THE LIVER FATTY ACIDS OF RAINBOW TROUT (*SALMO GAIARDNERI*). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):349-353. 1983. SFA 29(1)
[Aquacult. Prog., Anim. Sci. Dep., Univ. Calif., Davis 95616]
- 84-000174 Iga, T. BASIC PROPERTIES OF BETA ADRENERGIC RECEPTORS MEDIATING MELANOSOME DISPERSION OF MELANOPHORES IN A CYPRINID FISH, *ZACCO TEMMINCKI*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):297-303. 1983. SFA 29(1)
[Dep. Biol., Fac. Sci., Shimane Univ., Matsue 690, Japan]
- 84-000175 Ignat'eva, G. M. and N. V. Smirnova. DETERMINATION OF RNA CONTENT IN EGGS OF SOME FISHES AND AMPHIBIANS IN CONNECTION WITH THE REGULATION OF ONSET OF RNA SYNTHESIS IN THE EMBRYO. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 14(1):35-41. Nov. 1983. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000176 Ignat'eva, G. M. and A. S. Voronina. RNA SYNTHESIS DURING EMBRYOGENESIS OF *COREGONUS PELED*. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 12(5):314-319. July 1982. SFA 29(1)
[N. K. Kol'tsov Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000177 Iijima, N.; K. Zama and M. Kayama. EFFECT OF THE OXIDIZED LIPIDS ON THE METABOLIC PATHWAY OF LIPID BIOSYNTHESIS IN THE INTESTINE OF CARP. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1465-1470. Sept. 1983. SFA 29(1)
[Lab. Mar. Biochem., Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama 720, Japan]
- 84-000178 Isaacks, R. E. and H. D. Kim. ERYTHROCYTE PHOSPHATES AND OSMOTIC FRAGILITY IN THE AUSTRALIAN LUNGFISH AND OSTEOGLOSSID, *SCLEROPAGES SCHNEICHARDTI*. *Am. Zool.* 23(4):977. 1983. Abstract only. SFA 29(1)
[V. A. Med. Cent., Miami, FL]
- 84-000179 Iwamatsu, T. and K. Onitake. ON THE EFFECTS OF CYANOKETONE ON GONADOTROPHIN- AND STEROID-INDUCED *IN VITRO* MATURATION OF *ORYZIAS* OOCYTES. *Gen. Comp. Endocrinol.* 52(3):418-425. Dec. 1983. SFA 29(1)
[Dep. Biol., Aichi Univ. Educ., Igaya-cho, Kariya 448, Japan]
- 84-000180 Jacob, W. F. and M. H. Taylor. THE TIME COURSE OF SEAWATER ACCLIMATION IN *FUNDULUS HETEROCILITUS* L. *J. Exp. Zool.* 228(1):33-39. Oct. 1983. SFA 29(1)
[Coll. Mar. Stud., Univ. Del., Newark 19711]
- 84-000181 Jobling, M. A SHORT REVIEW AND CRITIQUE OF METHODOLOGY USED IN FISH GROWTH AND NUTRITION STUDIES. *J. Fish Biol.* 23(6):685-703. Dec. 1983. SFA 29(1)

PHYSIOLOGY (CONTINUED)

84-000181 CONTINUED

[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] A number of the techniques commonly employed in fish growth and nutrition studies are evaluated and limitations imposed by their use are indicated. Total and digestible energy values of dietary formulations should be measured directly and the use of caloric conversion coefficients and assumed digestibility values may lead to serious error. There is considerable misunderstanding relating to the term metabolizable energy and metabolizable energy has been estimated in a number of ways, all of which are unreliable. In view of this, it is suggested that there is a good case to be made for ceasing to use the term.

84-000182 Jobling, M. TOWARDS AN EXPLANATION OF SPECIFIC DYNAMIC ACTION (SDA). *J. Fish Biol.* 23(5):549-555. Nov. 1983. SFA 29(1)

[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Of the hypotheses proposed to explain specific dynamic action (SDA), it is suggested that the 'protein synthesis/growth' theory offers the best basis for further research. In the light of this, the relationships between rates of protein synthesis and metabolic rates are examined. Both of which are depressed with increasing periods of starvation and there appears to be a link between rates of protein synthesis and thyroid activity. SDA may represent a short-term increase in rates of protein synthesis and turnover following feeding and the process is possibly regulated via plasma levels of thyroid hormones.

84-000183 Johnson, J. E. IN VITRO METHODS FOR ASSAYING ENDOGENOUS NEUROTROPHIC FACTORS IN THE REGENERATING VISUAL SYSTEM OF THE GOLDFISH. Ph.D. dissertation, Wake Forest Univ. Bowman Gray Sch. Med. 173p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2038. Jan. 1984. SFA 29(1)

84-000184 Johnston, I. A.; F. B. Eddy and G. M. O. Maloiy. THE EFFECTS OF TEMPERATURE ON MUSCLE pH, ADENYLATE AND PHOSPHOGEN CONCENTRATIONS IN *OREOCHROMIS ALCALICUS GRAHAMI*, A FISH ADAPTED TO AN ALKALINE HOT-SPRING. *J. Fish Biol.* 23(6):717-724. Dec. 1983. SFA 29(1)

[Dep. Physiol., Univ. St. Andrews, St. Andrews, Fife KY16 9TS, Scotland]

84-000185 Johnstone, R.; D. J. Macintosh and R. S. Wright. ELIMINATION OF ORALLY ADMINISTERED 17 α -METHYLTESTOSTERONE BY *OREOCHROMIS MOSSAMBICUS* (TILAPIA) AND *SALMO GAIKNERI* (RAINBOW TROUT) JUVENILES. *Aquaculture* 35(3):249-257. Nov. 1983. SFA 29(1)

[DAFS Mar. Lab., Aberdeen, Scotland]

84-000186 Kah, O. and P. Chambolle. SEROTONIN IN THE BRAIN OF THE GOLDFISH, *CARRASSIUS AURATUS*. AN IMMUNOCYTOCHEMICAL STUDY. *Cell Tissue Res.* 234(2):319-333. Oct. 1983. SFA 29(1)

[Lab. Biol. Anim., Cent. Morphol. Exp. CNRS, Ave. Facultés, F-33405 Talence, France]

84-000187 Kah, O.; P. Chambolle; P. Dubourg and M. P. Dubois. IMMUNOCYTOCHEMICAL LOCALIZATION OF LUTEINIZING HORMONE-RELEASING HORMONE IN THE BRAIN OF THE GOLDFISH *CARRASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 53(1):107-115. Jan. 1984. SFA 29(1)

[Lab. Biol. Anim., Cent. Morphol. Exp. CNRS, Ave. Facultés, 33405 Talence Cedex, France]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000188 Karabanova, O. I. THE REACTION OF THE PITUITARY GLAND OF UNDERYEARLINGS OF THE RAINBOW TROUT, *SALMO GAIIRDNERI* (SALMONIDAE), TO A HYPOTONIC ENVIRONMENT AND THIOREA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):114-122. 1983. SFA 29(1)
[Lab. Exp. Ichthyol., Biol. Soil Fac., Leningrad Univ., USSR]
- 84-000189 Keegan-Rogers, V. DIFFERENTIAL REPRODUCTIVE SUCCESS AMONG CLONES OF UNISEXUAL FISH: GENETIC FACTORS AND RARE-FEMALE ADVANTAGE. *Am. Zool.* 23(4):1022. 1983. Abstract only. SFA 29(1)
[Univ. Conn., Storrs]
- 84-000190 Klyachko, O. S. and A. A. Neifakh. DISTRIBUTION OF ENDOGENOUS AND INJECTED LACTATE DEHYDROGENASE BETWEEN THE BLASTODERM AND THE YOLK IN LOACH EMBRYOS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 11(5):284-290. July 1981. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000191 Klyachko, O. S. and A. A. Neifakh. ISOLATION AND CHARACTERISTICS OF LDH-CONTAINING COMPLEXES FROM LOACH EMBRYOS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 11(5):291-296. July 1981. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000192 Knyazeva, E. F.; A. O. Benyumov and A. A. Kostomarova. SYNTHESIS AND ACCUMULATION OF NUCLEAR NONHISTONE PROTEINS IN LOACH OOCYTES AND EARLY EMBRYOS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 13(5):302-309. July 1983. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000193 Koban, M. and C. L. Prosser. FISH HEPATOCYTES IN PRIMARY CULTURE: A MODEL SYSTEM FOR TEMPERATURE ACCLIMATION STUDIES. *Am. Zool.* 23(4):886. 1983. Abstract only. SFA 29(1)
[Univ. Ill., Urbana]
- 84-000194 Kodama, M.; T. Ogata; T. Noguchi; J. Maruyama and K. Hashimoto. OCCURRENCE OF SAXITOXIN AND OTHER TOXINS IN THE LIVER OF THE PUFFERFISH *TAKIFUGU PARDALIS*. *Toxicon* 21(6):897-900. 1983. SFA 29(1)
[Lab. Mar. Biol. Chem., Sch. Fish. Sci., Kitasato Univ., Sanriku, Iwate 022-01, Japan]
- 84-000195 Kononov, Y. D. ION BINDING OF ORGANIC DYES IN EARLY ONTOGENESIS OF COMMON CARP, *CYPRINUS CARPIO* (CYPRINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):147-156. 1983. SFA 29(1)
[Inst. Hydrobiol., Acad. Sci. Ukrainian SSR, Kiev, USSR]
- 84-000196 Korzh, V. P. MICROINJECTION OF MACROMOLECULES AND MITOCHONDRIA INTO LOACH EGGS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 12(2):134-138. Jan. 1982. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]

PHYSIOLOGY (CONTINUED)

84-000197 Kosmath, I.; R. A. Patzner and H. Adam. REGRESSION IM OVAR VON MYXINE GLUTINOSA L. (CYCLOSTOMATA). I. ABBAU DER DOTTERPLÄTTCHEN IN DEN ATRETISCHEN FOLLIKELN. [REGRESSION IN THE OVARY OF MYXINE GLUTINOSA L. (CYCLOSTOMATA). I. DEGENERATION OF YOLK PLATELETS IN THE ATRETIC FOLLICLES.] Zool. Anz. 211(5-6):273-276. 1983. In German with English summ. SFA 29(1)

[Zool. Inst., Univ. Salzburg, Austria]

84-000198 Kozlov, A. N. and Z. S. Sil'yanova. PHYSIOLOGICAL-BIOCHEMICAL PECULIARITIES OF GONAD MATURATION OF MARBLED NOTOTHENIA, NOTOTHENIA ROSSI MARMORATA (NOTOTHENIIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiolog.) 23(2):169-172. 1983. SFA 29(1)

[VNIRO, Moscow, USSR]

84-000199 Langdon, J. S.; J. E. Thorpe and R. J. Roberts. EFFECTS OF CORTISOL AND ACTH ON GILL Na^+/K^+ -ATPase, SDH AND CHLORIDE CELLS IN JUVENILE ATLANTIC SALMON SALMO SALAR L. Comp. Biochem. Physiol. A Comp. Physiol. 77(1):9-12. 1984. SFA 29(1)

[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, U.K.]

84-000200 Langille, R. M. and J. H. Youson. LIPID ABSORPTION IN THE ANTERIOR INTESTINE AND TRANSITION ZONE REGIONS OF THE INTESTINE OF THE ADULT LAMPREY, PETROMYZON MARINUS (L.). Am. Zool. 23(4):894. 1983. Abstract only. SFA 29(1)

[Univ. Toronto, Toronto, ON, Canada]

84-000201 Lanza, J. POPULATION CONTROL OF AN ALL-FEMALE FISH, POECILIOPSIS MONACHA-LATIDENS. Biotropica 15(2):100-107. June 1983. SFA 29(1)

[Dep. Biol., SUNY, Fredonia, NY 14063] *Poeciliopsis monacha-latidens* is an all-female species of fish which mates with males of the bisexual species *P. latidens*. This study assesses the impact of several forces which potentially control the population size of *P. monacha-latidens*: sperm supply, habitat adaptation, and competition. In contrast to other all-female *Poeciliopsis* species, *P. monacha-latidens* populations are not primarily limited by a shortage of sperm. Instead, *P. monacha-latidens* appears to be poorly adapted to the fast-water habitat of its sexual host, *P. latidens*. In addition, *P. monacha-latidens* loses in competition with *P. latidens* for food in the late dry season in areas of low insect productivity.

84-000202 Lapkin, V. V.; A. G. Poddubnyy and A. M. Svirskiy. THERMOADAPTIVE PROPERTIES OF FISHES FROM TEMPERATURE LATITUDES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiolog.) 23(2):45-54. 1983. SFA 29(1)

[Inst. Biol. Inland Waters, Acad. Sci. USSR, Borok, Yaroslavl Prov., USSR] The thermoadaptive properties of fishes were examined in respect to age and season. The trends were analyzed from the standpoint of the theory of regulation and thermodynamics. In light of these concepts, thermoadaptation of fish is characterized by development of a regulated adaptive physiological-biochemical mechanism by the organism, which ensures stable stationary conditions for the organism in the zone of temperature tolerances.

PHYSIOLOGY (CONTINUED)

- 84-000203 Lee, E. and L. DiMichele. HORMONAL CONTROL OF ERYTHROCYTE FUNCTION IN *FUNDULUS HETEROCLOTUS*. *Am. Zool.* 23(4):912. 1983. Abstract only. SFA 29(1)
[Johns Hopkins Univ., Baltimore, MD]
- 84-000204 Lewis, R. J. and R. Endean. OCCURRENCE OF A CIGUATOXIN-LIKE SUBSTANCE IN THE SPANISH MACKEREL (*SCOMBEROMORUS COMMERSONI*). *Toxicon* 21(1):19-24. 1983. SFA 29(1)
[Dep. Zool., Univ. Queensland, St. Lucia, Brisbane, Queensland 4067, Australia]
- 84-000205 Lied, E.; G. Rosenlund; B. Lund and A. Von der Decken. EFFECT OF STARVATION AND REFEEDING ON *IN VITRO* PROTEIN SYNTHESIS IN WHITE TRUNK MUSCLE OF ATLANTIC COD (*GADUS MORHUA*). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(4):777-781. 1983. SFA 29(1)
[Inst. Nutr., Dir. Fish., P.O. Box 4285, N-5013, Bergen, Norway]
- 84-000206 Loughna, P. T.; L. C. Rome and G. Goldspink. THE EFFECTS OF TEMPERATURE ACCLIMATION UPON FIBER TYPE RECRUITMENT IN FISH MYOTOMAL MUSCLE. *Am. Zool.* 23(4):887. 1983. Abstract only. SFA 29(1)
[Univ. Hull, U.K.] Electromyography in carp has shown that mechanical power output of oxidative muscle is reduced at low temperatures and thus glycolytic fibers must be employed at low swim speeds resulting in fatigue. We examined the effects of temperature acclimation upon the swimming speed at which white muscle was recruited using electromyography. Fish were acclimated for 2 months at 8°C, 15°C and 26°C and then swum at 10°C and 20°C. At 10°C, the swimming speed at which white muscle was initially recruited was significantly higher in fish acclimated to low temperatures. Recruitment at 10°C occurred at 30 cm/s, 26 cm/s and 21 cm/s in fish acclimated at 8°C, 15°C and 26°C respectively. At 20°C white muscle was recruited at 44 cm/s in all groups. Thus, temperature acclimation of muscle allows fish to maintain higher sustainable swimming speeds at low temperatures.
- 84-000207 Lundblad, G.; R. Fänge and K. Slettengren. β -N-ACETYLHEXOSAMINIDASE AND α -D-MANNOSIDASE FROM THE EPIGONAL LYMPHOMYELOID ORGAN OF THE NURSE SHARK (*GINGLYMOSTOMA CIRRHATUM*). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(2):277-281. 1983. SFA 29(1)
[Dep. Chem., Natl. Bacteriol. Lab., S-10521 Stockholm, Sweden]
- 84-000208 Maemura, S. and T. Omura. DRUG-OXIDIZING MONO-OXYGENASE SYSTEM IN LIVER MICROSOMES OF GOLDFISH (*CARASSIUS AURATUS*). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(1):45-51. 1983. SFA 29(1)
[T. Omura: Dep. Biol., Fac. Sci., Kyushu Univ., Higashi-ku, Fukuoka 812, Japan]
- 84-000209 Mak, P. and G. V. Callard. ESTROGEN BINDING IN THE TESTIS OF THE DOGFISH (*SQUALUS ACANTHIAS*). *Am. Zool.* 23(4):974. 1983. Abstract only. SFA 29(1)
[Boston Univ., Boston, MA]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000210 Margolis-Kazan, H.; M. P. Schreiber and L. Halpern-Sebold. IMMUNOREACTIVE SEROTONIN AND SOMATOSTATIN IN THE BRAIN AND PITUITARY OF THE PLATYFISH. *Am. Zool.* 23(4):883. 1983. Abstract only. SFA 29(1)
[Dep. Biol., Brooklyn Coll., Brooklyn, NY]
- 84-000211 McCormick, S. D. EFFECTS OF SIZE, AGE AND PHOTOPERIOD ON HYPOSMOREGULATION IN BROOK TROUT, *Salvelinus fontinalis*. *Am. Zool.* 23(4):996. 1983. Abstract only. SFA 29(1)
[Woods Hole Oceanogr. Inst., Woods Hole, MA] In 11 experiments over 1.5 years, brook trout were gradually exposed to 32 ppt seawater for 20 d to investigate the ontogeny of salinity tolerance. Size was the primary determinant of seawater survival ($r^2 = 0.77$); the effect of size on seawater survival slowed after fish reached a fork length of 14 cm. The effect of age on seawater survival ($r^2 = 0.65$) was through its covariance with size. Photoperiod affected seawater survival only through its influence on the timing of male maturation, which decreased salinity tolerance. Hyposmoregulation of plasma osmolarity, $[Na^+]$, $[Cl^-]$, $[K^+]$, $[Mg^{2+}]$ and hematocrit increased linearly with size over the entire range of sizes (6-32 cm). Gill Na^+ , K^+ -ATPase activity after 20 d in seawater decreased with increasing size of brook trout, possibly reflecting decreased demand for active ion transport in larger fish. Size dependent survival and osmoregulatory ability of brook trout is compared to other salmonids and a conceptual model is developed.
- 84-000212 McFall-Ngai, M. J. PATTERNS, MECHANISMS, AND CONTROL OF LUMINESCENCE IN LEICGNATHID FISHES. *Ph.D. dissertation, Univ. Calif. (Los Angeles)* 200p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1690. Dec. 1983. SFA 29(1)
- 84-000213 Meyer, J. H. STEROID INFLUENCES UPON THE ELECTRIC ORGAN DISCHARGES OF WEAKLY ELECTRIC FISHES: SENSORY AND MOTOR CONSIDERATIONS. *Ph.D. dissertation, Univ. Calif. (San Diego)* 167p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1367. Nov. 1983. SFA 29(1)
- 84-000214 Michnovicz, J. J. A CEREBELLAR ROLE IN CONTROL OF THE GOLDFISH VESTIBULO-OCULAR REFLEX. *Ph.D. dissertation, Yeshiva Univ.* 238p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1367. Nov. 1983. SFA 29(1)
- 84-000215 Monaco, P. J.; E. M. Rasch and J. S. Balsano. THE OCCURRENCE OF SUPERFETATION IN THE AMAZON MOLLY, *POECILIA FORMOSA*, AND ITS RELATED SEXUAL SPECIES. *Copeia* 1983(4):969-974. 14 Dec. 1983. SFA 29(1)
[Dep. Biophys., Quillen-Dishner Coll. Med., East Tenn. State Univ., Johnson City 37614]
- 84-000216 Mourik, J. CARBON DIOXIDE PRODUCTION BY RED SKELETAL MUSCLE OF GOLDFISH (*CARASSIUS AURATUS* L.) AEROBIC AND ANAEROBIC METABOLISM OF GLUCOSE AND GLUTAMATE. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(1):151-156. 1984. SFA 29(1)
[Dep. Anim. Physiol., Gorlaeus Lab., Rijksuniversiteit, P.O. Box 9502, 2300 RA Leiden, The Netherlands]
- 84-000217 Mourik, J. OXIDATIONS IN THE TRICARBOXYLIC ACID CYCLE BY INTACT MITOCHONDRIA ISOLATED FROM THE LATERAL RED MUSCLE OF GOLDFISH (*CARASSIUS AURATUS* L.). EFFECTS OF ANOXIA ON THE OXIDATION OF PYRUVATE AND GLUTAMATE.

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000217 CONTINUED *Comp. Biochem. Physiol. B Comp. Biochem.* 76(4):851-859. 1983. SFA 29(1)
[Dep. Anim. Physiol., Gorleaus Lab., P.O. Box 9502, 2300 RA Leiden, The Netherlands]
- 84-000218 Nair, M. S. R.; I. Leong and M. S. B. Nayar. ICHTHYOTOXINS FROM THE OYSTER TOADFISH, *OPSANUS TAU* (LINNAEUS). *Toxicon* 20(5):933-935. 1982. SFA 29(1)
[Osborn Lab. Mar. Sci., N.Y. Aquarium, Brooklyn 11224] The oyster toadfish, *Opsanus tau*, secretes an ichthyotoxic mucous active against silversides (*Menidia menidia*). The structures of the toxins isolated, aliphatic ketones, are different from any of the known toxins from marine vertebrates.
- 84-000219 Nikitina, L. A. INVESTIGATION OF NUCLEAR PROPERTIES IN GROWING ASCIPENSERID OOCYTES BY MEANS OF SERIAL CLONING. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 13(1):35-40. Nov. 1982. SFA 29(1)
[Inst. Dev. Biol., USSR Acad. Sci., Moscow, USSR]
- 84-000220 Nilsson, S. and S. Holmgren. SPLANCHNIC NERVOUS CONTROL OF THE STOMACH OF THE SPINY DOGFISH, *SQUALUS ACANTHIAS*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):271-276. 1983. SFA 29(1)
[Dep. Zoophysiol., Univ. Göteborg, Box 250 59, S-400 31 Göteborg, Sweden]
- 84-000221 Niu, M. C. and L. C. Niu. RE-EXAMINATION OF THE DNA-MEDIATED TRANSFORMATION IN GOLDFISH. *Sci. Sin. Ser. B* 26(7):700-707. July 1983. SFA 29(1)
[Dep. Biol., Temple Univ., Philadelphia, PA 19112]
- 84-000222 Noeske, T. A. and R. E. Spieler. PHOTOPERIOD AND DIEL VARIATIONS OF SERUM CORTISOL, THYROXINE AND PROTEIN IN GOLDFISH, *CARRASSIUS AURATUS* L. *J. Fish Biol.* 23(6):705-710. Dec. 1983. SFA 29(1)
[Vert. Div., Milwaukee Publ. Mus., 800 West Wells St., Milwaukee 53233]
- 84-000223 Nordlie, F. G. and J. Whittier. INFLUENCE OF AMBIENT SALINITY ON PLASMA Ca^{2+} AND Mg^{2+} LEVELS IN JUVENILE *MUGIL CEPHALUS* L. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(2):335-338. 1983. SFA 29(1)
[Dep. Zool., Univ. Florida, Gainesville 32611]
- 84-000224 Nriagu, J. O. RAPID DECOMPOSITION OF FISH BONES IN LAKE ERIE SEDIMENTS. *Hydrobiologia* 106(3):217-222. 7 Oct. 1983. SFA 29(1)
[Natl. Water Res. Inst., Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada]
- 84-000225 O'Grady, S. M. ANTIFREEZE PEPTIDES AND GLYCOPEPTIDES IN POLAR FISHES. *Ph.D. dissertation, Univ. Ill.* 124p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1734. Dec. 1983. SFA 29(1)
- 84-000226 Ogata, H.; T. Murai and T. Nose. FREE AMINO ACID COMPOSITION IN URINE OF CARP AND CHANNEL CATFISH. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1471. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Div. Fish. Nutr., Natl. Res. Inst. Aquacult., Tamaki, Mie 519-04, Japan]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000227 Ohshima, T.; S. Wada and C. Koizumi. [COMPARISON OF LIPIDS BETWEEN CULTURED AND WILD SEA BREAMS.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1405-1409. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]
- 84-000228 Opdyke, D. F.; J. Bullock; N. E. Keller and K. Holmes. EFFECT OF GANGLIONIC BLOCKADE ON CATECHOLAMINE SECRETION IN EXERCISED DOGFISH. *Am. J. Physiol.* 245(6):R915-R919. Dec. 1983. SFA 29(1)
[Dep. Physiol., N.J. Med. Sch., Univ. Med. Dent. N.J., Newark 07103]
- 84-000229 Packer, R. and J. Brown. EFFECTS OF LACTIC ACID ON BLOOD ACID-BASE BALANCE AND OXYGEN TRANSPORT IN RAINBOW TROUT. *Am. Zool.* 23(4):893. 1983. Abstract only. SFA 29(1)
[George Washington Univ., Washington, DC]
- 84-000230 Pasmanik, M. and G. V. Callard. NEUROANATOMIC DISTRIBUTION OF AROMATASE AND 5 α -REDUCTASE IN GOLDFISH (*CARASSIUS*) AND TOADFISH (*OPSANUS*). *Am. Zool.* 23(4):972. 1983. Abstract only. SFA 29(1)
[Boston Univ., Boston, MA]
- 84-000231 Paul, M. J. and C. J. Burdick. Ca-ATPASES IN GILL EPITHELIUM OF SEA WATER AND FRESH WATER-ADAPTED *FUNDULUS HETEROCLOTIS*. *Am. Zool.* 23(4):912. 1983. Abstract only. SFA 29(1)
[CUNY, Brooklyn Coll., Brooklyn, NY]
- 84-000232 Pennec, J. P. and Y. M. Le Bras. STORAGE AND RELEASE OF CATECHOLAMINES BY NERVOUS ENDINGS IN THE ISOLATED HEART OF THE EEL (*ANGUILLA ANGUILLA* L.). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(1):167-171. 1984. SFA 29(1)
[Fac. Sci. Tech., Univ. Bretagne Occidentale Lab. Physiol. Anim., ERA CNRS 622, 6 Ave. Victor Le Gorgeu, 29283 Brest Cédex, France]
- 84-000233 Pinto, A. and D. Piomelli. VASOCONSTRICTORY EFFECTS OF ADRENALIN ON THE PERFUSED HEAD OF THE EEL (*ANGUILLA ANGUILLA* L.). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(1):209-213. 1983. SFA 29(1)
[Inst. Exp. Pharmacol., Sch. Pharm., Univ. Naples, Italy]
- 84-000234 Plisetskaya, E.; S. Bhattacharya; W. W. Dickhoff and A. Gorbman. INSULIN EFFECTS *IN VITRO* ON PROTEIN METABOLISM AND GLYCOGEN CONTENT IN HEPATOCYTES OF JUVENILE SALMON. *Am. Zool.* 23(4):1010. 1983. Abstract only. SFA 29(1)
- 84-000235 Portus, M. I. G.; E. L. Donald and A. Focesi, Jr. HEMOGLOBINAS EM SILURÍDEOS DA AMAZÔNIA CENTRAL: I. ANÁLISE ELETROFORÉTICA DOS HEMOLISADOS. [HEMOGLOBINS IN SILURIDS OF CENTRAL AMAZONIA: I. ELECTROPHORETIC ANALYSIS OF BLOOD.] *Acta Amazonica* 12(4):707-711. Dec. 1982. In Portuguese with English summ. SFA 29(1)
[Inst. Nac. Pesq. Amazônia, Manaus, Brazil]
- 84-000236 Primor, N. and P. Lazarovici. *PARDACHIRUS MARMORATUS* (RED SEA FLATFISH) SECRETION AND ITS ISOLATED TOXIC FRACTION PARDAXIN: THE RELATIONSHIP BETWEEN HEMOLYSIS AND ATPase INHIBITION. *Toxicon*

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

84-000236 CONTINUED 19(4):573-578. SFA 29(1)

[N. Y. Univ. Med. Cent., 550 First Ave., New York 10016]

84-000237 Quérat, B.; A. Hardy and J. Leloup-Hatey. ENDOCRINOLOGIE. - ÉTUDE DE LA LIAISON PLASMATIQUE DES STÉROÏDES SEXUELS ET DU CORTISOL CHEZ L'ANGUILLE FEMELLE (*ANGUILLA ANGUILLA* L.). [ENDOCRINOLOGY. - SEXUAL STEROIDS AND CORTISOL PLASMA BINDING IN THE EUROPEAN EEL (*ANGUILLA ANGUILLA* L.).] C. R. Hebd. Seances Acad. Sci. Ser. III Sci. Vie 297(3):119-122. 26 Sept. 1983. In French with English summ. SFA 29(1)

[Lab. Physiol. Gen. Comp., Mus. Natl. Hist. Nat., 7, rue Cuvier, 75231 Paris Cedex 05, France]

84-000238 Redding, J. M. and C. B. Schreck. INFLUENCE OF AMBIENT SALINITY ON OSMOREGULATION AND CORTISOL CONCENTRATION IN YEARLING COHO SALMON DURING STRESS. *Trans. Am. Fish. Soc.* 112(6):800-807. Nov. 1983. SFA 29(1)

[Lab. Physiol. Gen. Comp., Mus. Natl. Hist. Nat., 7, rue Cuvier, 75005 Paris, France]

84-000239 Richter, J.; J. Lombardi and J. P. Wourms. BRANCHIAL PLACENTA AND EMBRYONIC GROWTH IN THE VIVIPAROUS FISH, *JENYNSIA*. *Am. Zool.* 23(4):1017. 1983. Abstract only. SFA 29(1)

[Univ. N. C., Chapel Hill]

84-000240 Ritchie, T. C.; C. A. Livingston; M. G. Hughes; D. J. McAdoo and R. B. Leonard. THE DISTRIBUTION OF SEROTONIN IN THE CNS OF AN ELASMOBRANCH FISH: IMMUNOCYTOCHEMICAL AND BIOCHEMICAL STUDIES IN THE ATLANTIC STINGRAY, *DASYATIS SABINA*. *J. Comp. Neurol.* 221(4):429-443. 20 Dec. 1983. SFA 29(1)

[Mar. Biomed. Inst., Univ. Tex. Med. Br., Galveston 77550]

84-000241 Roberts, D. E., Jr. and H. J. Grier. COMPARISON OF TESTIS STRUCTURE BETWEEN THE PROTOGYNOUS SEA BASS, *CENTROPRISTIS STRIATUS*, AND TWO OTHER PERCIFORM FISHES, THE RED DRUM, *SCIAENOPS OCELLATUS*, AND SNOOK, *CENTROPOMIS UNDECIMALIS*. *Am. Zool.* 23(4):945. 1983. Abstract only SFA 29(1)

[Fla. Dep. Nat. Resour., Bur. Mar. Res., St. Petersburg]

84-000242 Rogers, S. C. and A. H. Weatherley. THE USE OF OPERCULAR MUSCLE ELECTROMYOGRAMS AS AN INDICATOR OF THE METABOLIC COSTS OF FISH ACTIVITY IN RAINBOW TROUT, *SALMO GAIARDNERI* RICHARDSON, AS DETERMINED BY RADIOTELEMETRY. *J. Fish Biol.* 23(5):535-547. Nov. 1983. SFA 29(1)

[Life Sci. Div., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

84-000243 Ruby, S. M. and V. Cairns. IMPLICATIONS OF TESTICULAR CONSTRICTIONS ON SPERMATOGENESIS IN LAKE ONTARIO LAKE TROUT, *SALVELINUS NAMAYCUSH*. *J. Fish Biol.* 23(4):385-395. Oct. 1983. SFA 29(1)

[Dep. Biol. Sci., Water Pollut. Res. Lab., Concordia Univ., Montreal, PQ, Canada] This study examines the histological significance of a testicular anomaly among hatchery-raised lake trout, *Salvelinus namaycush*,

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

84-000243 CONTINUED introduced into Lake Ontario as yearlings and subsequently recaptured at ages ranging from 4 to 7 years. The anomaly has been termed a constriction. Histological examination revealed that lake trout with constricted testes demonstrated delayed cycles of spermatogenesis throughout the testes at spawning time compared with normal testes. Constrictions were formed when spermatogonia within an adjacent group of lobules failed to undergo mitosis, hypertrophied and were subsequently resorbed. The walls of these lobules subsequently collapsed and were resorbed and replaced by dense fibrous connective tissue. The significance of these observations in relation to hormonal mechanisms and its potential effect upon reproduction in these fish is discussed.

84-000244 Saat, T. V. CHRONOLOGY OF OOCYTE MATURATION IN THE LOACH AND THE ACQUISITION OF DEVELOPMENTAL CAPACITY. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 13(3):159-166. Mar. 1983. SFA 29(1)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR]

84-000245 Sakai, D. K. LYTIC AND BACTERICIDAL PROPERTIES OF SALMONID SERA. *J. Fish Biol.* 23(4):457-466. Oct. 1983. SFA 29(1)
[Hokkaido Fish Hatchery, Nakanoshima 2, Toyohira, Sapporo 062, Japan]

84-000246 Sas, E. and L. Maler. THE NUCLEUS PRAEEMINENTIALIS: A GOLGI STUDY OF A FEEDBACK CENTER IN THE ELECTROSENSORY SYSTEM OF GYMNOTID FISH. *J. Comp. Neurol.* 221(2):127-144. 1 Dec. 1983. SFA 29(1)
[Dep. Anat., Fac. Health Sci., Univ. Ottawa, Ottawa, ON K1H 8M5, Canada]

84-000247 Schmidt, J. T. REGENERATION OF THE RETINOTECTAL PROJECTION FOLLOWING COMPRESSION ONTO A HALF TECTUM IN GOLDFISH. *J. Embryol. Exp. Morphol.* 77:39-51. Oct. 1983. SFA 29(1)
[Dep. Biol. Sci., State Univ. N. Y., 1400 Washington Ave., Albany 12222]

84-000248 Schreibman, M. P.; L. R. Halpern-Sebold; H. Margolis-Kazan and P. W. Perlman. THE EFFECTS OF ANDROGENS ON THE STRUCTURE AND FUNCTION OF THE BRAIN-PITUITARY-GONAD AXIS OF PLATYFISH. *Am. Zool.* 23(4):882. 1983. Abstract only. SFA 29(1)
[Biol. Dep., Brooklyn Coll., Brooklyn, NY]

84-000249 Schroeder, G. L. THE STABLE ISOTOPES OF CARBON: INDIGENOUS TRACERS IN AQUACULTURE FOOD WEBS. *Bamidgeh* 35(3):79-90. Sept. 1983. SFA 29(1)
[Fish Aquacult. Res. Stn., Agric. Res. Organ., Dor, Hof HaCarmel, Israel]

84-000250 Scott, A. P. and J. P. Sumpter. A COMPARISON OF THE FEMALE REPRODUCTIVE CYCLES OF AUTUMN-SPAWNING AND WINTER-SPAWNING STRAINS OF RAINBOW TROUT (*SALMO GAIARDNERI* RICHARDSON). *Gen. Comp. Endocrinol.* 52(1):79-85. Oct. 1983. SFA 29(1)
[Fish. Lab., Lowestoft, Suffolk, NR33 OHT, England]

84-000251 Sheridan, M. A. HORMONAL REGULATION OF LIPID MOBILIZATION IN FISH: EFFECT OF EPINEPHRINE AND NOREPINEPHRINE ON FREE FATTY ACID RELEASE FROM COHO SALMON (*ONCORHYNCHUS KISUTCH*) LIVER INCUBATED *IN VITRO*. *Am.*

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

84-000251 CONTINUED Zool. 23(4):1010. 1983. Abstract only. SFA 29(1)
[Univ. Calif., Berkeley]

84-000252 Shuttleworth, R. J. ROLE OF CALCIUM IN cAMP-MEDIATED EFFECTS IN THE ELASMOBRANCH RECTAL GLAND. *Am. J. Physiol.* 245(6):R894-R900. Dec. 1983. SFA 29(1)
[Dep. Biol. Sci., Univ. Exeter, Exeter EX4 4PS, U.K.]

84-000253 Smatresk, N. J. CONTROL OF AIR BREATHING AND GILL VENTILATION IN LONGNOSE GAR. *Am. Zool.* 23(4):893. 1983. Abstract only. SFA 29(1)
[Univ. Tex., Arlington]

84-000254 Smith, C. E.; W. P. Dwyer and R. G. Piper. EFFECT OF WATER TEMPERATURE ON EGG QUALITY OF CUTTHROAT TROUT. *Prog. Fish-Cult.* 45(3):176-178. July 1983. SFA 29(1)
[U.S. FWS, Fish Cult. Dev. Cent., Bozeman, MT 59715]

84-000255 Sower, S. A.; N. M. Sherwood and E. Plisetskaya. GONADOTROPIN-RELEASING HORMONE IN TWO CYCLOSTOMES, THE SEA LAMPREY (*PETROMYZON MARINUS*) AND HAGFISH (*EPTATRETUS STOUTI*). *Am. Zool.* 23(4):882. 1983. Abstract only. SFA 29(1)
[Univ. N. H., Durham]

84-000256 Strelkov, L. A. and N. B. Chiaureli. DISTRIBUTION OF NEWLY FORMED POLY(A)-CONTAINING RNAs IN SUBCELLULAR FRACTIONS OF EARLY LOACH EMBRYOS. *Sov. J. Dev. Biol. (Engl. Transl. Ontogenez)* 13(5):292-301. July 1983. SFA 29(1)
[Inst. Molec. Biol., Acad. Sci. USSR, Moscow, USSR]

84-000257 Sugita, H.; K. Oshima; M. Tamura and Y. Deguchi. BACTERIAL FLORA IN THE GASTROINTESTINE OF FRESHWATER FISHES IN THE RIVER. *Bull. Jpn. Soc. Sci. Fish.* 49(9):1387-1395. Sept. 1983. SFA 29(1)
[Dep. Fish., Coll. Agric. Vet. Med., Nihon Univ., Setagaya, Tokyo 154, Japan]

84-000258 Sullivan, C. V.; W. W. Dickhoff; S. D. Brewer and G. P. Johnston. PLASMA THYROID-HORMONE CONCENTRATIONS AND GILL (Na+K)-ATPASE ACTIVITIES IN POSTEMERGENT PINK SALMON. *Trans. Am. Fish. Soc.* 112(6):825-829. Nov. 1983. SFA 29(1)
[Sch. Fish., Univ. Wash., Seattle 98195]

84-000259 Sullivan, K. M. CHANGES IN AEROBIC METABOLISM AND MUSCLE BIOCHEMISTRY OF OVERWINTERING FRESHWATER FISHES. *Am. Zool.* 23(4):886. 1983. Abstract only. SFA 29(1)
[Cent. Limnol., Univ., Wis., Madison] Largemouth bass (*Micropterus salmoides*) and yellow perch (*Perca flavescens*) were collected in late summer and fall, and held throughout the winter under conditions of low

PHYSIOLOGY (CONTINUED)

84-000259 CONTINUED temperature, oxygen and food. Throughout the winter, respiration and ammonia excretion rates were measured twice monthly on whole fish. Liver and muscle tissue were excised and aerobic respiration rates were determined with a Warburg apparatus. Muscle enzyme activities, protein and lipid content of the fish were also determined. Yellow perch, a predominantly cool-water fish, showed lower but extremely variable rates of oxygen consumption during the winter months, and lower aerobic metabolism in liver tissues, and a high tolerance to hypoxic conditions. Largemouth bass, a predominantly warm-water species, showed a relatively constant oxygen consumption rate throughout the winter, with a sharp drop as visceral lipid stores were depleted. Aerobic metabolism was high in liver tissues, and tolerance to hypoxic conditions was low in bass.

84-000260 Swift, D. J. BLOOD COMPONENT VALUE CHANGES IN THE ATLANTIC MACKEREL (*SCOMBER SCOMBRUS* L.) SUBJECTED TO CAPTURE, HANDLING AND CONFINEMENT. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(4):795-802. 1983. SFA 29(1)

[Fish. Lab., Lowestoft, Suffolk NR 33 0HT, U.K.] This paper describes the measurement of whole blood lactate, glucose and cortisol concentrations in mackerel subjected to a number of stressors: capture by hooking, confinement in tanks or floating net enclosures, overcrowding in purse seine net simulation trials and tagging with internal metal tags. The physiological changes induced by the different stressors followed a pattern expected from work with other teleosts. Some stressed mackerel were observed to change their skin colour from green to blue, the "normal" colour of a dead mackerel. However, no correlation of this change with the blood component measurements or the type of stressor applied was found. There was no correlation between the blood component values and the degree of skin loss suffered by some fish. Estimates of the "normal" concentrations of whole blood lactate, glucose and cortisol are given.

84-000261 Tachibana, M. IONIC CURRENTS OF SOLITARY HORIZONTAL CELLS ISOLATED FROM GOLDFISH RETINA. *J. Physiol. (Lond.)* 345:329-351. Dec. 1983. SFA 29(1)

[Dep. Inf. Physiol., Natl. Inst. Physiol. Sci., Myodaiji, Okazaki 444, Japan]

84-000262 Trexler, J. C. FIELD STUDIES OF ENVIRONMENTAL EFFECTS ON GROWTH RATES WITH SIBLING GROUPS OF THE SAILFIN MOLLY. *Am. Zool.* 23(4):962. 1983. Abstract only. SFA 29(1)

[Fla. State Univ. Tallahassee]

84-000263 Tsang, P. C. and I. P. Callard. REGULATION OF STEROIDOGENESIS IN THE SPINY DOGFISH, *SQUALUS ACANTHIAS*. *Am. Zool.* 23(4):973. 1983. Abstract only. SFA 29(1)

[Boston Univ., Boston, MA]

84-000264 Van den Thillart, G.; M. Van Berge-Henegouwen and F. Kesbeke. ANAEROBIC METABOLISM OF GOLDFISH, *CARRASSIUS AURATUS* (L.): ETHANOL AND CO₂ EXCRETION RATES AND ANOXIA TOLERANCE AT 20, 10 AND 5°C. *Comp. Biochem. Physiol. A Comp. Physiol.* 76(2):295-300. 1983. SFA 29(1)

[State Univ. Leiden, P.O. Box 9502, 2300 RA Leiden, Netherlands]

SPORT FISHERY ABSTRACTS

PHYSIOLOGY (CONTINUED)

- 84-000265 Wahle, R. J. and W. S. Zaugg. ADULT COHO SALMON RECOVERIES AND THEIR Na^+-K^+ ATPASE ACTIVITY AT RELEASE. *Mar. Fish. Rev.* 44(11):11-13. Nov. 1982. SFA 29(1)
[NMFS, 847 N.E. 19th Ave., Suite #350, Portland, OR 97232]
- 84-000266 Wakeman, J. M. and D. E. Wohlschlag. TIME COURSE OF OSMOTIC ADAPTATION WITH RESPECT TO BLOOD SERUM OSMOLALITY AND OXYGEN UPTAKE IN THE EURYHALINE TELEOST, *SCIAENOPS OCELLATUS* (RED DRUM). *Contrib. Mar. Sci.* 26:165-177. Sept. 1983. SFA 29(1)
[La. Tech. Univ., Ruston 71270]
- 84-000267 Walsh, P. J.; G. D. Foster and T. W. Moon. THE EFFECTS OF TEMPERATURE ON METABOLISM OF THE AMERICAN EEL *ANGUILLA ROSTRATA* (LESUEUR): COMPENSATION IN THE SUMMER AND TORPOR IN THE WINTER. *Physiol. Zool.* 56(4):532-540. Oct. 1983. SFA 29(1)
[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]
- 84-000268 Warr, G. W. IMMUNOGLOBULIN OF THE TOADFISH, *SPHEROIDES GLABER*. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(3):507-514. 1983. SFA 29(1)
[Dep. Biochem., Med. Univ. S. C., 171 Ashley Ave., Charleston 29425]
- 84-000269 Warr, G. W.; D. DeLuca and D. P. Anderson. THYMOCYTE PLASMA MEMBRANE OF THE RAINBOW TROUT, *SALMO GAIIRDNERI*: ASSOCIATED IMMUNOGLOBULIN AND HETEROANTIGENS. *Comp. Biochem. Physiol. B Comp. Biochem.* 76(3):515-521. 1983. SFA 29(1)
[Dep. Biochem., Med. Univ. S. C., 171 Ashley Ave., Charleston 29425]
- 84-000270 Weatherley, A. H. and H. S. Gill. PROTEIN, LIPID, WATER AND CALORIC CONTENTS OF IMMATURE RAINBOW TROUT, *SALMO GAIIRDNERI* RICHARDSON, GROWING AT DIFFERENT RATES. *J. Fish Biol.* 23(6):653-673. Dec. 1983. SFA 29(1)
[Life Sci. Div., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]
- 84-000271 Weber, R. E. TMAO (TRIMETHYLAMINE OXIDE)-INDEPENDENCE OF OXYGEN AFFINITY AND ITS UREA AND ATP SENSITIVITIES IN AN ELASMOBRANCH HEMOGLOBIN. *J. Exp. Zool.* 228(3):551-554. Dec. 1983. SFA 29(1)
[Inst. Biol., Univ. Odense, DK 5230 Odense, M, Denmark]
- 84-000272 Wedemeyer, G. A.; R. W. Gould and W. T. Yasutake. SOME POTENTIALS AND LIMITS OF THE LEUCOCRIT TEST AS A FISH HEALTH ASSESSMENT METHOD. *J. Fish Biol.* 23(6):711-716. Dec. 1983. SFA 29(1)
[USFWS, Natl. Fish Res. Cent., Bldg. 204, Naval Stn., Seattle, WA 98115]
- 84-000273 Welsh, M. J.; P. L. Smith and R. A. Frizzell. INTRACELLULAR CHLORIDE ACTIVITIES IN THE ISOLATED PERFUSED SHARK RECTAL GLAND. *Am. J. Physiol.* 245(5):F640-F644. Nov. 1983. SFA 29(1)
[Mount Desert Island Biol. Lab., Salsbury Cove, ME 04672]

PHYSIOLOGY (CONTINUED)

- 84-000274 Wendelaar Bonga, S. E.; C. J. M. Löwik and J. C. A. Van der Meij. EFFECTS OF EXTERNAL Mg^{2+} AND Ca^{2+} ON BRANCHIAL OSMOTIC WATER PERMEABILITY AND PROLACTIN SECRETION IN THE TELEOST FISH *SAROTHERODON MOSSAMBICUS*. *Gen. Comp. Endocrinol.* 52(2):222-231. Nov. 1983. SFA 29(1)
[Dep. Zool., Univ. Nijmegen, 6525 ED Nijmegen, Netherlands]
- 84-000275 Wolburg, H.; R. Kästner and G. Kurz-Isler. LACK OF ORTHOGONAL PARTICLE ASSEMBLIES AND PRESENCE OF TIGHT JUNCTIONS IN ASTROCYTES OF THE GOLDFISH (*CARASSIUS AURATUS*). A FREEZE-FRACTURE STUDY. *Cell Tissue Res.* 234(2):389-402. Oct. 1983. SFA 29(1)
[Inst. Pathol., Liebermeisterstr. 8, D-7400 Tübingen, West Germany]
- 84-000276 Yamagata, Y.; S. Oonaka; M. Harada and M. Niwa. [INFLUENCE OF CONCENTRATION OF DISSOLVED OXYGEN ON THE GROWTH OF JAPANESE EEL *ANGUILLA JAPONICA*.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1335-1339. Sept. 1983. SFA 29(1)
[Pref. Off. Ise Fish. Fish. Port, Seta, Ise 516, Japan]
- 84-000277 Yip, L. L.; C. L. Chow; K. H. Yung and K. W. Chiu. TOXIC MATERIAL FROM THE GALLBLADDER OF THE GRASS CARP (*CTENOPHARYNGODON IDELLUS*). *Toxicol.* 19(4):567-569. 1981. SFA 29(1)
[Dep. Biol., Chinese Univ. Hong Kong, Hong Kong]
- 84-000278 Young, G. and J. N. Ball. ULTRASTRUCTURAL CHANGES IN THE ADENOHYPOPHYSIS DURING THE OVARIAN CYCLE OF THE VIVIPAROUS TELEOST *POECILIA LATIPINNA*. III. THE GROWTH HORMONE, ADRENOCORTICOTROPHIC, AND PROLACTIN CELLS AND THE PARS INTERMEDIA. *Gen. Comp. Endocrinol.* 52(1):86-101. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Calif., Berkeley 94720]
- 84-000279 Young, G.; H. Ueda and Y. Nagahama. ESTRADIOL-17 β AND 17 α ,20 β -DIHYDROXY-4-pregnen-3-ONE PRODUCTION BY ISOLATED OVARIAN FOLLICLES OF AMAGO SALMON (*ONCORHYNCHUS RHODURUS*) IN RESPONSE TO MAMMALIAN PITUITARY AND PLACENTAL HORMONES AND SALMON GONADOTROPIN. *Gen. Comp. Endocrinol.* 52(2):329-335. Nov. 1983. SFA 29(1)
[Y. Nagahama: Lab. Reprod. Biol., Natl. Inst. Basic Biol., 38 Nishigonaka, Myodaijicho, Okazaki 444, Japan]
- 84-000280 Zeitler, M. H.; M. Kirchgessner and F. J. Schwarz. EFFECTS OF DIFFERENT PROTEIN AND ENERGY SUPPLIES ON CARCASS COMPOSITION OF CARP (*CYPRINUS CARPIO* L.). *Aquaculture* 36(1-2):37-48. 1 Jan. 1984. SFA 29(1)
[Inst. Ernährungsphysiol., Tech. Univ. München, D-8050 Freising-Weihenstephan, West Germany]
- GENETICS, VARIATION STUDIES AND HYBRIDIZATION
- 84-000281 Altukhov, Y. P. and N. V. Varnavskaya. ADAPTIVE GENETIC STRUCTURE AND ITS RELATIONSHIP TO INTRAPOPULATIONAL SEX, AGE, AND GROWTH RATE DIFFERENTIATION IN SOCKEYE, *ONCORHYNCHUS NERKA* (WALB.). *Genetika*

SPORT FISHERY ABSTRACTS

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-000281 CONTINUED 19(5):614-624. Nov. 1983. SFA 29(1)

[Inst. Gen. Genet., Acad. Sci. USSR, Moscow, USSR] The relationship between genetic structure for three isozyme loci (Ldh, Pgm, Px) and intrapopulational differentiation for sex, age, and growth rate was studied in spawning stocks of sockeye. In conformity to earlier-presented data on heterosis for the Pgm locus, new evidence is obtained of selection in favor of heterozygotes which are encountered reliably more often among the rapidly growing and maturing young males. The large males show minimal heterozygosity, while the females are characterized by an intermediate frequency of heterozygous genotypes. The significance of such a genetic differentiation of populations is discussed in connection with rational fishery practice.

84-000282 Aref'ev, V. A. POLYKARYOGRAPHIC ANALYSIS OF SHEAP STURGEON, *ACIPENSER NUDIVENTRIS* (ACIPENSERIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):26-35. 1983. SFA 29(1)

[All-Union Planning Surv. Res. Inst., "Gidroproekt," Moscow, USSR]

84-000283 Balon, E. K. EPIGENETIC MECHANISMS: REFLECTIONS ON EVOLUTIONARY PROCESSES. *Can. J. Fish. Aquatic Sci.* 40(11):2045-2058. Nov. 1983. SFA 29(1)

[Dep. Zool., Univ. Guelph, Guelph, ON M1G 2W1, Canada]

84-000284 Beck, M. L. and C. J. Biggers. PLOIDY OF HYBRIDS BETWEEN GRASS CARP AND BIGHEAD CARP DETERMINED BY MORPHOLOGICAL ANALYSIS. *Trans. Am. Fish. Soc.* 112(6):808-811. Nov. 1983. SFA 29(1)

[Dep. Biol., Memphis State Univ., Memphis TN 38152]

84-000285 Brown, D. C.; N. Ramakrishna and D. A. Powers. GENETIC VARIATION AND CHARACTERIZATION OF ASPARTATE AMINOTRANSFERASE (AAT) ISOZYMES OF *FUNDULUS HETEROCLITUS*. *Am. Zool.* 23(4):911. 1983. Abstract only. SFA 29(1)

[Johns Hopkins Univ., Baltimore, MD]

84-000286 Burkhead, N. M. and B. H. Bauer. AN INTERGENERIC CYPRINID HYBRID, *HYBOPSIS MONACHA* X *NOTROPIS GALACTURUS*, FROM THE TENNESSEE RIVER DRAINAGE. *Copeia* 1983(4):1074-1077. 14 Dec. 1983. SFA 29(1)

[Dep. Biol., Roanoke Coll., Salem, VA 24153]

84-000287 Chourrout, D. PRESSURE-INDUCED RETENTION OF SECOND POLAR BODY AND SUPPRESSION OF FIRST CLEAVAGE IN RAINBOW TROUT: PRODUCTION OF ALL-Triploids, ALL-Tetraploids, and Heterozygous and Homozygous Diploid Gynogenetics. *Aquaculture* 36(1-2):111-126. 1 Jan. 1984. SFA 29(1)

[Lab. Physiol. Poissons, CNRZ-INRA, 78350 Jouy-en-Josas, France]

84-000288 Collares-Pereira, M. J. and M. M. Coelho. BIOMETRICAL ANALYSIS OF *CHONDROSTOMA POLYLEPIS* X *RUTILUS ARCASII* NATURAL HYBRIDS (OSTEICHTHYES--CYPRINIFORMES--CYPRINIDAE). *J. Fish Biol.* 23(5):495-509. Nov. 1983. SFA 29(1)

[Cent. Fauna Portuguesa, Lab. Zool. Antropol., Fac. Ciências, 1200 Lisboa, Portugal]

SPORT FISHERY ABSTRACTS

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-000289 Dawley, R. M. REPRODUCTION AND POLYPLOIDY IN PUMPKINSEED X GREEN SUNFISH HYBRIDS. *Am. Zool.* 23(4):944. 1983. Abstract only. SFA 29(1)
[Univ. Conn., Storrs] In a number of fishes, amphibians, and reptiles hybridization can trigger unusual meiotic mechanisms that lead to polyploidy. Here I report the existence of such a mechanism in a population of Pumpkinseed x Green Sunfish hybrids in Hall's Pond, Eastford, CT. The hybrids are abundant, outnumbering both parent species. Female hybrids are fertile and, when backcrossed to either parent species, produce triploid offspring. Differences in electrophoretic staining intensity indicate that female hybrids produce diploid eggs that are subsequently fertilized to yield triploid offspring. However, only a few adult triploids have been found in Hall's Pond. Male hybrids are probably sterile, even though they are seen guarding nests with fry. Males produce only a small amount of abnormal sperm and lab spawnings involving male hybrids resulted in eggs that failed to develop. The electrophoretic phenotypes of fry from the nests of fourteen male hybrids suggest that these fry are not the hybrid's offspring.

84-000290 Gjerde, B. and T. Gjerdem. ESTIMATES OF PHENOTYPIC AND GENETIC PARAMETERS FOR CARCASS TRAITS IN ATLANTIC SALMON AND RAINBOW TROUT. *Aquaculture* 36(1-2):97-110. 1 Jan. 1984. SFA 29(1)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, Ås-NLH, Norway]

84-000291 Graham, J. H. and J. Felley. DEVELOPMENTAL STABILITY AND GENOMIC COADAPTATION IN HYBRID SUNFISH. *Am. Zool.* 23(4):966. 1983. Abstract only. SFA 29(1)
[Rutgers Univ., Piscataway, NJ]

84-000292 Graves, J. E.; R. H. Rosenblatt and G. N. Somero. KINETIC AND ELECTROPHORETIC DIFFERENTIATION OF LACTATE DEHYDROGENASES OF TELEOST SPECIES-PAIRS FROM THE ATLANTIC AND PACIFIC COASTS OF PANAMA. *Evolution* 37(1):30-37. Jan. 1983. SFA 29(1)
[NMFS, Southwest Fish. Cent., P.O. Box 271, La Jolla, CA 92038]

84-000293 Jiashen, Z.; S. Junbao and L. Minghua. [A CYTOLOGICAL STUDY ON THE GYNOGENESIS OF FANG-ZHENG CRUCIAN CARP OF HEILONGJIANG PROVINCE.] *Acta Zool. Sin.* 29(1):11-16. 1983. In Chinese with English summ. SFA 29(1)
[Heilongjiang Fish. Res. Inst., Natl. Bur. Fish., Harbin, China]

84-000294 Kang, L.; L. Yucheng; Z. Mi and Z. Dun. STUDIES ON THE KARYOTYPES OF CHINESE CYPRINID FISHES. II. KARYOTYPES OF FOUR SPECIES OF XENOCYPRININAE. *Acta Zool. Sin.* 29(3):207-213. 1983. In Chinese with English summ. SFA 29(1)
[Dep. Biol., Wuhan Univ., China]

84-000295 Kartavtsev, Y. P. and A. M. Mamontov. [ELECTROPHORETIC STUDY OF PROTEIN VARIABILITY AND SIMILARITY OF *COREGONUS AUTUMNALIS*, TWO FORMS OF WHITEFISH (COREGONIDAE) AND GRAYLING (THYMALLIDAE) FROM THE BAIKAL LAKE.] *Genetika* 19(11):1895-1902. 1983. In Russian with English summ. SFA 29(1)
[Inst. Mar. Biol. Far East Sci. Cent., Acad. Sci. USSR, Vladivostok, USSR]

84-000296 Leary, R. F.; F. W. Allendorf and K. L. Knudsen. CONSISTENTLY HIGH MERISTIC COUNTS IN NATURAL HYBRIDS BETWEEN BROOK TROUT AND BULL TROUT. *Syst. Zool.* 32(4):369-376. Dec. 1983. SFA 29(1)

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-000296 CONTINUED

[Dep. Zool., Univ. Mont., Missoula 59812] We detected hybrids between the bull trout (*Salvelinus confluentus*) and the brook trout (*S. fontinalis*) in three samples from the Upper Columbia River drainage in Montana using 10 isozyme loci that differentiate these species. The occurrence of only first generation, male hybrids indicates that these hybrids are almost certainly sterile. We counted 10 meristic characters from all of the bull trout, brook trout, and their hybrids in the sample from the South Fork of Lolo Creek. Univariate and multivariate analyses of meristic data conclusively indicated that the hybrids are not meristically intermediate to the parental species. The hybrids had counts higher than either of the parental species or counts similar to the parental species with the higher count. The consistent tendency for the hybrids to have high meristic counts is suggested to be due to reduced developmental rate caused by genetic incompatibility between the parental genomes.

84-000297 Logvinenko, B. M.; O. P. Kodolova and I. B. Polyanskaya. POLYMORPHISM OF NONSPECIFIC ESTERASES OF RUFFE, *GYMNOCEPHALUS CERNUA* (PERCIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):165-168. 1983. SFA 29(1)

[Moscow State Univ., Moscow, USSR]

84-000298 Mayhew, D. A. A NEW HYBRID CROSS, *NOTROPIS ATHERINOIDES* X *NOTROPIS VOLUCELLUS* (PISCES: CYPRINIDAE), FROM THE LOWER MONONGAHELA RIVER, WESTERN PENNSYLVANIA. *Copeia* 1983(4):1077-1082. 14 Dec. 1983. SFA 29(1)

[Ecological Analysts, Inc., 15 Loveton Circle, Sparks, MD 21152]

84-000299 McGlade, J. M.; M. C. Annand and T. J. Kenchington. ELECTROPHORETIC IDENTIFICATION OF *SEBASTES* AND *HELICOLENUS* IN THE NORTHWESTERN ATLANTIC. *Can. J. Fish. Aquatic Sci.* 40(11):1861-1870. Nov. 1983. In English with French summ. SFA 29(1)

[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

84-000300 Morgan, R. P. II; R. E. Smith, Jr. and J. R. Stauffer, Jr. ELECTROPHORETIC SEPARATION OF LARVAL SILVER REDHORSE (*MOXOSTOMA ANISURUM*) AND GOLDEN REDHORSE (*MOXOSTOMA ERYTHRURUM*). *Comp. Biochem. Physiol. B Comp. Biochem.* 76(4):721-722. 1983. SFA 29(1)

[Univ. Md., CEES, Appl. Environ. Lab., Frostburg State Coll., Gunter Hall, Frostburg 21532]

84-000301 Morizot, D. C.; J. A. Greenspan and M. J. Siciliano. LINKAGE GROUP VI OF FISH OF THE GENUS *XIPHOPHORUS* (POECILIIDAE): ASSIGNMENT OF GENES CODING FOR GLUTAMINE SYNTHETASE, URIDINE MONOPHOSPHATE KINASE, AND TRANSFERRIN. *Biochem. Genet.* 21(9-10):1041-1049. Oct. 1983. SFA 29(1)

[Univ. Tex. Syst. Cancer Cent. Sci. Park, Res. Div., Smithville 78957]

84-000302 Mork, J. and G. Sundnes. POPULATION GENETIC STUDIES IN FISH MAY START AT THE EGG STAGE; EXAMPLES FROM GADOID SPECIES IN NORWEGIAN WATERS. *Sarsia* 68(3):171-175. 1983. SFA 29(1)

[Biol. Stn., N-7001 Trondheim, Norway]

SPORT FISHERY ABSTRACTS

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-000303 Murofushi, M.; S. Nishikawa and T. H. Yosida. CYTOGENETICAL STUDIES ON FISHES. V. MULTIPLE SEX CHROMOSOME MECHANISM (XX-Y) FOUND IN TWO DRAGONET FISHES. *Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 59(3):58-61. Mar. 1983. SFA 29(1)

[Mishima Jr. Coll., Nihon Univ., Mishima, Japan]

84-000304 Murofushi, M.; S. Nishikawa and T. H. Yosida. CYTOGENETICAL STUDIES ON FISHES, IV. KARYOTYPES OF SIX SPECIES IN THE SPAROID FISHES. *Jpn. J. Genet.* 58(4):361-367. Aug. 1983. SFA 29(1)

[Lab. Biol., Mishima Jr. Coll., Nihon Univ., Mishima, 411 Japan]

84-000305 Philipp, D. P.; W. F. Childers and G. S. Whitt. BIOCHEMICAL GENETICS OF LARGEMOUTH BASS. FINAL REPORT. *Ill. Nat. Hist. Surv.* 281p. Oct. 1982. From U.S. Government Reports 83(12):2583. Available from NTIS as DE83900568. SFA 29(1)

84-000306 Present, T. M. C. ELECTROPHORETIC COMPARISON OF DISJUNCT GULF OF CALIFORNIA AND PACIFIC OUTER COAST POPULATIONS OF A MARINE SHORE FISH, *HYPSOBLENNIUS JENKINSI*. *Am. Zool.* 23(4):966. 1983. Abstract only. SFA 29(1)

[Scripps Inst. Oceanogr., La Jolla, CA]

84-000307 Ráb, P.; P. Liehman and M. Prokeš. KARYOTYPES OF *CICHLASOMA TETRACANTHUM* (PISCES, CICHLIDAE) FROM CUBA. *Folia Zool. (Brno)* 32(2):185-188. 1983. In English with Czech summ. SFA 29(1)

[Inst. Anim. Physiol. Genet., Dep. Genet., Czech Acad. Sci., Liběchov, Czechoslovakia]

84-000308 Ropson, I. J. and D. A. Powers. CLINAL VARIATION, INHERITANCE, AND CHARACTERIZATION OF HEXOSE 6 PHOSPHATE DEHYDROGENASE (H6PDG) FROM *FUNDULUS HETEROCALITUS*. *Am. Zool.* 23(4):911. 1983. Abstract only. SFA 29(1)

[Johns Hopkins Univ., Baltimore, MD]

84-000309 Scheerer, P. D. and G. H. Thorgaard. INCREASED SURVIVAL IN SALMONID HYBRIDS BY INDUCED TRIPLOIDY. *Can. J. Fish. Aquatic Sci.* 40(11):2040-2044. Nov. 1983. In English with French summ. SFA 29(1)

[Prog. Genet. Cell Biol., Wash. State Univ., Pullman 99164-4350]

84-000310 Schwartz, F. J. WORLD LITERATURE TO FISH HYBRIDS WITH AN ANALYSIS BY FAMILY, SPECIES, AND HYBRID: SUPPLEMENT 1. *NOAA Tech. Rep. NMFS SSRF* 750. iii + 507p. Nov. 1981. SFA 29(1)

[Inst. Mar. Sci., Univ. N.C., 3407 Arendell St., Morehead City 28557] Supplement 1 comprises 1,814 citations published between 1971 and October 1980 which deal with fish hybrids of the world. Continuing the format of the original compilation, each reference has been read, analyzed, and referenced by author, family, species, and hybrid cross

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

- 84-000311 Sismour, E. N.; S. Ackerman and R. S. Birdsong. TISSUE EXPRESSION OF SELECTED ENZYMES IN THE AMERICAN SHAD, *ALOSA SAPIDISSIMA*. Va. J. Sci. 34(3):133. 1983. Abstract only. SFA 29(1)
[Dep. Biol., Old Dominion Univ., Norfolk, VA 23508]
- 84-000312 Stelling, J. M.; I. J. Ropson and D. A. Powers. 6 PHOSPHOGLUCONATE DEHYDROGENASE (6PGDH) OF *FUNDULUS HETEROCLITUS*: CLINAL VARIATION AND PURIFICATION. Am. Zool. 23(4):911. 1983. Abstract only. SFA 29(1)
[Johns Hopkins Univ., Baltimore, MD]
- 84-000313 Stratil, A.; P. Bobák; V. Romášek and M. Valenta. TRANSFERRINS OF *BARBUS BARBUS*, *BARBUS MERIDIONALIS PETENYI* AND THEIR HYBRIDS. GENETIC POLYMORPHISM, HETEROGENEITY AND PARTIAL CHARACTERIZATION. Comp. Biochem. Physiol. B Comp. Biochem. 76(4):845-850. 1983. SFA 29(1)
[Czech. Acad. Sci., Inst. Anim. Physiol. Genet., 277 21 Liběchov, Czechoslovakia]
- 84-000314 Strelkov, L. A.; N. B. Chiaureli and C. A. Kafiani. [THE ROLE FOR NUCLEUS-ASSOCIATED POLYRIBOSOMES IN COORDINATION OF HISTONE AND DNA SYNTHESIS IN LOACH EMBRYONIC CELLS.] Molec. Biol. 17(5):1077-1088. Sept.-Oct. 1983. In Russian with English summ. SFA 29(1)
[Inst. Molec. Biol., Acad. Sci. USSR, Moscow, USSR]
- 84-000315 Taniguchi, N.; K. Sumantadinata and S. Iyama. GENETIC CHANGE IN THE FIRST AND SECOND GENERATIONS OF HATCHERY STOCK OF BLACK SEABREAM. Aquaculture 35(4):309-320. Dec. 1983. SFA 29(1)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]
- 84-000316 Thode, G. and M. C. Alvarez. THE CHROMOSOME COMPLEMENTS OF TWO SPECIES OF *GOBIUS* (TELEOSTEI, PERCIFORMES). Experientia (Basel) 39(11):1312-1314. 15 Nov. 1983. SFA 29(1)
[M. C. Alvarez: Dep. Genet., Fac. Ciencias, Univ. Málaga, Málaga, Spain]
The karyotypes of *G. bucchichi*, 2n=44, and *G. cruentatus*, 2n=46, are described. No chromosome differences have been revealed between males and females of either of these gonochoristic species. The results are compared with data from other species of the same genus.
- 84-000317 Turner, B. J. GENIC VARIATION AND DIFFERENTIATION OF REMNANT NATURAL POPULATIONS OF THE DESERT PUFFISH, *CYPRINODON MACULARIUS*. Evolution 37(4):690-700. July 1983. SFA 29(1)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]
- 84-000318 Turner, B. J.; J. S. Balsano; P. J. Monaco and E. M. Rasch. CLONAL DIVERSITY AND EVOLUTIONARY DYNAMICS IN A DIPLOID-TRIPLOID BREEDING COMPLEX OF UNISEXUAL FISHES (*POECILIA*). Evolution 37(4):798-809. July 1983. SFA 29(1)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-000319 Ueda, T.; Y. Ojima; T. Kato and Y. Fukuda. CHROMOSOMAL POLYMORPHISMS IN THE RAINBOW TROUT (*SALMO GAIIRDNERI*). *Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 49(6):168-171. June 1983. SFA 29(1)

[Dep. Biol., Fac. Educ., Utsunomiya Univ., Utsunomiya 321, Japan]

84-000320 Uwa, H.; T. Iwamatsu and O. P. Saxena. KARYOTYPE AND CELLULAR DNA CONTENT OF THE INDIAN RICEFISH, *ORYZIAS MELASTIGMA*. *Proc. Jpn. Acad. Ser. B Phys. Biol. Sci.* 59(3):43-47. Mar. 1983. SFA 29(1)

[Dep. Biol., Fac. Sci., Shinshu Univ., Matsumoto, 390, Japan]

84-000321 Wilson, R. R., Jr. and R. S. Waples. DISTRIBUTION, MORPHOLOGY, AND BIOCHEMICAL GENETICS OF *CORYPHAENOIDES ARMATUS* AND *C. YAQUINAE* (PISCES: MACROURIDAE) IN THE CENTRAL AND EASTERN NORTH PACIFIC. *Deep-Sea Res. A Oceanogr. Res. Pap.* 30(11):1127-1145. Nov. 1983. SFA 29(1)

[Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

BEHAVIOR

84-000322 Barlow, G. W. DO GOLD MIDAS CICHLID FISH WIN FIGHTS BECAUSE OF THEIR COLOR, OR BECAUSE THEY LACK NORMAL COLORATION? *Behav. Ecol. Sociobiol.* 13(3):197-204. Sept. 1983. SFA 29(1)

[Dep. Zool., Univ. Calif., Berkeley 94720]

84-000323 Brooks, W. R. and R. N. Mariscal. THE ACCLIMATION OF ANEMONE FISHES TO SEA ANEMONES: PROTECTION BY CHANGES IN THE MUCOUS COAT OF THE FISH. *Am. Zool.* 23(4):881. 1983. Abstract only. SFA 29(1)

[Fla. State Univ., Tallahassee]

84-000324 Dominey, W. J. MOBBING IN COLONIALY NESTING FISHES, ESPECIALLY THE BLUEGILL, *LEPOMIS MACROCHIRUS*. *Copeia* 1983(4):1086-1088. 14 Dec. 1983. SFA 29(1)

[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

84-000325 Downhower, J. F.; L. Brown; R. Pederson and G. Staples. SEXUAL SELECTION AND SEXUAL DIMORPHISM IN MOTTLED SCULPINS. *Evolution* 37(1): 96-103. Jan. 1983. SFA 29(1)

[Dep. Zool., Ohio State Univ., Columbus]

84-000326 Englert, J. and B. H. Seghers. HABITAT SEGREGATION BY STREAM DARTERS (PISCES: PERCIDAE) IN THE THAMES RIVER WATERSHED OF SOUTHWESTERN ONTARIO. *Can. Field-Nat.* 97(2):177-180. Apr.-June 1983. SFA 29(1)

[B.H. Seghers: Kananaskis Cent. Environ. Res., Univ. Calgary, Seebe, AB T0L 1X0, Canada] Habitat segregation among five species of darters were studied in the Thames River watershed of southwestern Ontario during May-September in 1977 and 1978. Direct underwater observations and quantitative net sampling demonstrated that each species occupied a wide range of habitats; however, some degree of segregation was found. Rainbow (*Etheostoma caeruleum*) and Greenside (*E. blennioides*) darters predominated in riffles and Johnny (*E. nigrum*) and Blackside (*Percina maculata*) darters were found mainly in pools or raceways. Fantail Darters (*E. flabellare*) were common in both riffles and raceways.

BEHAVIOR (CONTINUED)

84-000327 Fine, M. L. and M. L. Lenhardt. SHALLOW-WATER PROPAGATION OF THE TOADFISH MATING CALL. *Comp. Biochem. A Physiol. Comp. Physiol.* 76(2):225-231. 1983. SFA 29(1)

[Dep. Biol., Va. Commonwealth Univ., Richmond 23284]

84-000328 Gordon, M. S.; H. Chin and L. Attardo. POWER REQUIREMENTS FOR FISH SWIMMING: AN EXPERIMENTAL TEST OF THEORY. *Am. Zool.* 23(4):956. 1983. Abstract only. SFA 29(1)

[Univ. Calif., Los Angeles] Current theory predicts that the power required for swimming by fishes increases in proportion to absolute swimming speed raised to the 2.5 power. This theory was developed on the basis of studies of teleost fishes swimming in the subcarangiform mode, obtaining thrust from lateral oscillations of their bodies. We have estimated power requirements for swimming in seven species of teleost fishes which keep their bodies rigid during steady prolonged cruising speed swimming: three species of labriform swimmers, four of ostraciiform/tetrodontiform swimmers. Estimates of rates of power generation were based on rates of oxygen consumption during steady swimming in water tunnels. Values for the exponent in curves relating mass-specific metabolic rates to absolute swimming speeds were estimated in two ways. Twenty-two of twenty-four estimates were significantly lower than the theoretically predicted 2.5. Sixteen were for values below 10% of the predicted value. New theory seems needed to account for these results.

84-000329 Hanlon, R. T.; R. F. Hixon and D. G. Smith. BEHAVIORAL ASSOCIATIONS OF SEVEN WEST INDIAN REEF FISHES WITH SEA ANEMONES AT BONAIRE, NETHERLANDS ANTILLES. *Bull. Mar. Sci.* 33(4):928-934. 1983. SFA 29(1)

[Mar. Biomed. Inst., Univ. Tex. Med. Br., 200 University Blvd., Galveston 77550-2772] The antipredatory behavior of dwelling within the tentacular sphere of sea anemones was observed in seven species of reef fishes. Three of these species are new records of anemone-dwelling fishes: the clinid *Starksia hassi* Klauswitz and the gobies *Quisquilius hipoliti* Metzelaar) and *Lythrypnus nesiotes* Böhlke and Robins. All associations are facultative. Only *Starksia hassi* was observed in full contact with the tentacles without noticeable harm.

84-000330 Henrichfreise, G. and G. Dücker. VERGLEICHENDE UNTERSUCHUNGEN ZUM PROBLEM DES SERIALEN UMKEHRLERNENS BEI FISCHEN (*CARASSIUS AURATUS* L., *CYPRINUS CARPIO* L., *SALMO GAIARDNERI* RICHARDSON). [COMPARATIVE INVESTIGATIONS ON SERIAL REVERSAL DISCRIMINATION LEARNING IN FISH (*CARASSIUS AURATUS* L., *CYPRINUS CARPIO* L., *SALMO GAIARDNERI* RICHARDSON).] *Zool. Anz.* 211(3-4):197-213. 1983. In German with English summ. SFA 29(1)

[G. Dücker: Zool. Inst., Abt. Verhaltensforsch., Badestr. 9, D-4400 Münster, West Germany] Serial discrimination learning could be proved in three fish-species: goldfish, carp and trout. In principle all three species were able to reduce number of errors progressively in a series of reversals when confronted with a visual discrimination task. In the related species, goldfish and carp the larger carp was superior. The type of visual discrimination task (easy color discrimination red versus blue, or more difficult shape discrimination triangle versus cross) influenced the results. The method, too, had influence on the results. When carp and trout were trained in each reversal up to a criterion there was no remarkable difference between both, when using a method by which the meaning of the stimuli (positive or negative) was changed every two days independent from success of learning only the carp showed interreversal learning. No positive results were obtained with trouts.

BEHAVIOR (CONTINUED)

84-000331 Kawamura, G.; T. Shimowada and K. Banno. [EFFECT OF GENERAL AND LOCAL LIGHTING ON THE SHAPE DISCRIMINATION OF DARK ADAPTED FISH.] *Bull. Jpn. Soc. Sci. Fish.* 49(8):1183-1186. Aug. 1983. In Japanese with English summ. SFA 29(1)

[Fac. Fish., Kagoshima Univ., 4-50-20 Shimoarata, Kagoshima 890, Japan]

84-000332 Koltes, K. H. TEMPORAL PATTERNS AND ENVIRONMENTAL RESPONSES IN THE THREE-DIMENSIONAL STRUCTURE AND ACTIVITY OF THE ATLANTIC SILVERSIDE, *MENIDIA MENIDIA* (L.). *Ph.D. dissertation, Univ. R.I.* 155p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(7):2041. Jan. 1984. SFA 29(1)

Results demonstrated a strong seasonal rhythm in the behavior of silverside schools. Nearest neighbor distances were significantly different between spring, summer, fall and winter while swimming speed and depth of the school in the tank changed significantly across 3 seasons. Polarization was bimodally distributed with peaks in spring and fall. The seasonal pattern of silverside schooling behavior correlates with their reproductive and migratory cycles and may act as an anti-predator strategy. Results of the copper experiments showed that the behavior of schools under copper-exposed versus control conditions was significantly different. At low levels of copper (less than 100 ug/l), schools were observed to increase their swimming speed, decrease their nearest neighbor distances and swim more in parallel orientation than schools under control conditions. This response is similar to the fright reaction of schooling fishes and is interpreted as a stress response.--From abstr.

84-000333 Kratochvil, H. and M. Müllebnner. BIOLOGISCHE LAUTPRODUKTION BEI *COLISA LALIA* HAMILTON-BUCHANAN (ANABANTOIDEI, PISCES). [BIOLOGICAL SOUND PRODUCTION IN *COLISA LALIA* HAMILTON-BUCHANAN (ANABANTOIDEI, PISCES).] *Zool. Anz.* 211(5-6):324-328. 1983. In German with English summ. SFA 29(1)

[Zool. Inst., Univ. Wien, Austria] During nest defending male *Colisa lalia* often produce short single tone bursts. The noise can only be heard when they swim fast against the opponents. The attacks, which are aided by articulation, are more aimed against females than males. Besides a second high frequend type of sound was determined which occurs only in the ritualized fights of the males.

84-000334 Lanza, J. MICROHABITAT USE BY BISEXUAL AND UNISEXUAL FISHES (*POECILIOPSIS*: *POECILIIDAE*) IN AN ARTIFICIAL STREAM. *Oecologia (Berl.)* 57(1-2):142-147. Mar. 1983. SFA 29(1)

[Dep. Biol., State Univ. N. Y., Fredonia 14063]

84-000335 Losey, G. S., Jr. INTRA- AND INTERSPECIFIC AGGRESSION BY THE CENTRAL AMERICAN MIDAS CICHLID FISH, *CICHLASOMA CITRINELLUM*. *Behaviour* 79(1):39-80. 1982. In English with French summ. SFA 29(1)

[Dep. Zool., Univ. Hawaii, Kaneohe]

84-000336 Matheson, R. E., Jr. and G. R. Brooks, Jr. HABITAT SEGREGATION BETWEEN *COTTUS BAIRDI* AND *COTTUS GIRARDI*: AN EXAMPLE OF COMPLEX INTER- AND INTRASPECIFIC RESOURCE PARTITIONING. *Am. Midl. Nat.* 110(1):165-176. July 1983. SFA 29(1)

[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843] Habitat segregation was documented for populations of *Cottus bairdi* and *C. girardi* in Naked Creek, Virginia. Habitat partitioning was most obvious in terms of current velocity and substrate type. Two groups could be defined: male and immature *C. girardi* preferred slow current and silty substrates

BEHAVIOR (CONTINUED)

84-000336 CONTINUED or beds of aquatic vascular plants, while female and immature *C. bairdi* preferred faster current and larger substrate particle sizes or algal beds. Male *C. bairdi* and female *C. girardi* were somewhat intermediate between these two groups in habitat preference. The possibility of interactive segregation between these two species is discussed.

84-000337 Mathur, D.; R. M. Schutsky; E. J. Purdy, Jr. and C. A. Silver. SIMILARITIES IN AVOIDANCE TEMPERATURES OF FRESHWATER FISHES. *Can. J. Fish. Aquatic Sci.* 40(12):2144-2152. Dec. 1983. In English with French summ. SFA 29(1)

[RMC-Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

84-000338 Mosca, P. J. and M. L. Fine. ANATOMICAL EVIDENCE FOR SYNCHRONIZATION OF FAST TOADFISH SWIMBLADDER MUSCLE. *Va. J. Sci.* 34(3):130. 1983. Abstract only. SFA 29(1)

[Dep. Biol., Va. Commonwealth Univ., Richmond 23284]

84-000339 Moss, R. E.; J. W. Scanlan and C. S. Anderson. OBSERVATIONS ON THE NATURAL HISTORY OF THE BLUE SUCKER (*CYCLEPTUS ELONGATUS* LE SUEUR) IN THE NEOSHO RIVER. *Am. Midl. Nat.* 109(1):15-22. Jan. 1983. SFA 29(1)

[Mus. Nat. Hist., Univ. Kans., Lawrence 66045] Populations of blue suckers in the Neosho River in Kansas were sampled by electrofishing during the spring and summer 1976 and 1977. Spawning occurred in deep riffles (1-2 m) with cobble and bedrock substrates in May at water temperatures of 20-23 C. By August, juveniles averaged 125 mm in length. Mature females reach greater maximum ages, weights and lengths (9 years, 4.1 kg, 763 mm T.L.) than males (7 years, 3.7 kg, 749 mm T.L.). In general, adult females were larger than adult males. Condition coefficients vary slightly with time of year. Only a few juveniles were captured, but young blue suckers occupied shallower and less swift water than adults. Laboratory stream observations confirm a preference for smooth substrates in swift current. Food of adults and young consisted primarily of insect larvae and plant material. Blue suckers seem limited by habitat, especially during spawning.

84-000340 Pajak, P. AN EVALUATION OF ROCK BASS HABITAT IN VIRGINIA STREAMS. *Va. J. Sci.* 34(3):132. 1983. Abstract only. SFA 29(1)

[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Reliable evaluations of fish habitat are critical for impact assessment and mitigative management. However, no evaluation techniques have escaped the operational constraints imposed by the practical limits of sampling, variable correlation/interaction, and consideration of unique on-site features. The Fish and Wildlife Service has recently developed a Habitat Evaluation Procedure (HEP) which attempts to describe habitat suitability for a particular species using Habitat Suitability Index models (HSI's) for essential habitat parameters. This procedure incorporates both habitat quality and quantity into "Habitat Units" (HU's) for the species being evaluated. HSI's have not been field validated for most species. This investigation sought to test the assumption that rock bass HU's and standing stocks were positively correlated. Results of fish marking studies suggest that temporal variation in habitat utilization may significantly affect model predictions based on a single "critical" evaluation period.

BEHAVIOR (CONTINUED)

84-000341 Partridge, B. L.; J. Johansson and J. Kalish. THE STRUCTURE OF SCHOOLS OF GIANT BLUEFIN TUNA IN CAPE COD BAY. *Environ. Biol. Fishes* 9(3-4):253-262. 1 Dec. 1983. SFA 29(1)

[Dep. Biol., Univ. Miami, Coral Gables, FL 33124] We report the first investigation of the structure of schools of predatory fish, analyzed from aerial photographs of Atlantic bluefin tuna, *Thunnus thynnus*, in the wild. Internal structure of formations of giant bluefin supports two hypotheses for the formation of predatory fish schools. The parabolic shape of the schools suggests that tuna hunt cooperatively and the position of fish within the schools is such that individuals benefit from hydrodynamical interactions with their neighbors.

84-000342 Savitz, J.; P. A. Fish and R. Weszely. EFFECTS OF FORAGE ON HOME-RANGE SIZE OF LARGEMOUTH BASS. *Trans. Am. Fish. Soc.* 112(6):772-776. Nov. 1983. SFA 29(1)

[Biol. Dep., Loyola Univ., 6525 N. Sheridan Rd., Chicago, IL 60626]

84-000343 Shtaf, L. G.; D. S. Pavlov; M. A. Skorobogatov and A. S. Barekhan. THE INFLUENCE OF FLOW TURBULENCE ON FISH BEHAVIOR. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):129-140. 1983. SFA 29(1)

[IEMEZh, Moscow, USSR]

LIFE HISTORY-GENERAL WORKS

84-000344 Cailliet, G. M. and D. W. Bedford. THE BIOLOGY OF THREE PELAGIC SHARKS FROM CALIFORNIA WATERS, AND THEIR EMERGING FISHERIES: A REVIEW. *Calif. Coop. Oceanic Fish. Invest.* 24:57-69. Oct. 1983. In English with Spanish summ. SFA 29(1)

[Moss Landing Mar. Lab., P.O. Box 223, Moss Landing, CA 95039]

84-000345 Claridge, P. N. and I. C. Potter. MOVEMENTS, ABUNDANCE, AGE COMPOSITION AND GROWTH OF BASS, *DICENTRARCHUS LABRAX*, IN THE SEVERN ESTUARY AND INNER BRISTOL CHANNEL. *J. Mar. Biol. Assoc. U.K.* 63(4):871-879. Nov. 1983. SFA 29(1)

[Nat. Environ. Res. Council, Inst. Mar. Environ. Res., Prospect Pl., The Hoe, Plymouth PL1 3DHK, England] The movements, abundance, age composition and growth of bass, *Dicentrarchus labrax* (L.), in the Severn Estuary and inner Bristol Channel have been described from regular samples of fish taken from power-station intake screens between 1972 and 1977. Bass began to move into the estuary during late August or September and reached peak abundance between September and early November. The tendency for fish to move seawards in the late autumn and winter may be related to declining water temperatures in the estuary. Likewise, differences in abundance between years appear to be related to annual differences in temperature. Although the populations were dominated by the 0+ age class, successively decreasing numbers of the next four age classes and occasional 5+ fish were also present. Respective mean standard lengths of bass in the estuary at the end of their first to fifth years of life were approximately 65 mm (± 4.5 g), 130 mm (± 37.9 g), 190 mm (± 121.1 g), 250 mm (± 280.4 g) and 290 mm (± 441.5 g). Growth occurred predominantly between May and September, with the mean standard length of 1+ fish increasing from approximately 65 mm (± 4.5 g) to 130 mm (± 37.9 g).

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-000346 Crawford, T. THE WHITE AMUR (*CTENOPHARYNGODON IDELLA*). Ark. Game Fish 15(1):17-18. 1984. SFA 29(1)

84-000347 Darcy, G. H. SYNOPSIS OF BIOLOGICAL DATA ON THE PIGFISH, *ORTHOPRISTIS CHRYSOPTERA* (PISCES: HAEMULIDAE). NOAA Tech. Rep. NMFS Circ. 449. iii + 23p. Mar. 1983. SFA 29(1)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

84-000348 Darcy, G. H. SYNOPSIS OF BIOLOGICAL DATA ON THE GRUNTS *HAEMULON AUROLINEATUM* AND *H. PLUMIERI* (PISCES: HAEMULIDAE). NOAA Tech. Rep. NMFS Circ. 448. iv + 37p. Feb. 1983. SFA 29(1)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

84-000349 Eck, G. W. and L. Wells. BIOLOGY, POPULATION STRUCTURE, AND ESTIMATED FORAGE REQUIREMENTS OF LAKE TROUT IN LAKE MICHIGAN. U.S. Fish Wildl. Serv. Tech. Pap. 111. 18p. 1983. SFA 29(1)
[U.S. FWS, Great Lakes Fish. Lab., 1451 Green Rd., Ann Arbor, MI 48105]
Data collected during successive years (1971-79) of sampling lake trout (*Salvelinus namaycush*) in Lake Michigan were used to develop statistics on lake trout growth, maturity, and mortality, and to quantify seasonal lake trout food and food availability. These statistics were then combined with data on lake trout year-class strengths and age-specific food conversion efficiencies to compute production and forage fish consumption by lake trout in Lake Michigan during the 1979 growing season (i.e., 15 May-1 December). An estimated standing stock of 1,486 metric tons (t) at the beginning of the growing season produced an estimated 1,129 t of fish flesh during the period. The lake trout consumed an estimated 3,037 t of forage fish, to which alewives (*Alosa pseudoharengus*) contributed about 71%, rainbow smelt (*Osmerus mordax*) 18%, and slimy sculpins (*Cottus cognatus*) 11%. Seasonal changes in bathymetric distributions of lake trout with respect to those of forage fish of a suitable size for prey were major determinants of the size and species compositions of fish in the seasonal diet of lake trout.

84-000350 Grigor'ev, S. S. NEW CATCHES OF YOUNG NORTHERN WOLFFISH, *ANARHICHAS DENTICULATUS* (ANARHICHADIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 23(2):157-160. 1983. SFA 29(1)
[PINRO, Murmansk, USSR]

84-000351 Hashem, M. T. BIOLOGICAL STUDIES ON *SIGANUS RIVULATUS* (FORSK.) IN THE RED SEA. J. Fac. Mar. Sci. (Jeddah) 3:119-128. 1983. In English with Arabic summ. SFA 29(1)
[Fac. Mar. Sci., King Abdulaziz Univ., Jeddah, Saudi Arabia]

84-000352 Hoffman, S. G. and D. R. Robertson. FORAGING AND REPRODUCTION OF TWO CARIBBEAN REEF TOADFISHES (BATRACHOIDIDAE). Bull. Mar. Sci. 34(4):919-927. 1983. SFA 29(1)
[Mar. Sci. Prog., Univ. Houston, 4700 Ave. U, Galveston, TX 77550]
Amphichthys cryptocentrus and *Sanopus barbatus* were studied in the San Blas Archipelago, off the Caribbean coast of Panama. Both species occupy burrows in sand areas in and immediately adjacent to coral reefs. Daily censuses of 9 tagged *A. cryptocentrus* and 24 tagged burrows in a 45 X 50 m study area showed that individuals vary in the duration of time spent in a particular burrow: most fish move to another burrow every 3 days but some fish remain in the same burrow for up to 6 months. Ten burrows that were never occupied during the survey were also tagged and censused daily; these

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-000352 CONTINUED burrows had been used by toadfish before our censusing began. An average of 58% of the 24 known burrows was unoccupied on any census day. A fish can excavate a new burrow in about 1 day although they do so only rarely. Both toadfishes feed primarily on the abundant urchin, *Diadema antillarum*. The guts of 40 out of 48 fishes had at least one urchin bolus and contained little other food. Using predation rates and the population density of *A. cryptocentrus*, we estimate that this species may consume 20,000 urchins/ha/yr. However, the impact of toadfish predation on urchin populations in Panama remains undetermined. Live urchins were fewer in number near burrows occupied by *A. cryptocentrus* than near unoccupied burrows. This distribution may result from toadfish predation or the movement of urchins away from injured or preyed-upon conspecifics. Free-swimming juveniles were found in the burrows of adult male *A. cryptocentrus*. This association is known in three other toadfishes but is uncommon in marine teleosts.

84-000353 Hosford, W. E. and S. P. Pribyl. BLITZEN RIVER REDBAND TROUT EVALUATION. Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep. No. 83-9. iii + 32p. July 1983. SFA 29(1)
[Oreg. Dep. Fish. Wildl., Hines]

84-000354 Iwan, G. R. POPULATION DENSITY, AGE CLASS COMPOSITION AND PRODUCTIVITY OF THE LARGEMOUTH BLACK BASS, *MICROPTERUS SALMOIDES* (LACEPEDE) IN AN UNEXPLOITED NORTHEASTERN LAKE. Ph.D. dissertation, Fordham Univ. 432p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1707. Dec. 1983. SFA 29(1)

The population dynamics, growth, survival, food habits, distribution, biomass, standing crop and production of the unexploited largemouth black bass population of Calder Lake, N.Y. were determined in 1974-1975. Results were compared with ecological parameter data for possible interrelationships and evaluations were made of the efficacy of various techniques employed in the study. The largemouth black bass population was estimated by electrofishing at 1686 ± 158 bass aged 0⁺ - XI⁺, equally divided between males and females and heterogeneously distributed with the highest densities occurring in warm, weed, littoral areas. Statistical analyses ($p = 0.05$) showed few differences by location in physical or chemical parameter measurements to depths of 3 m or for bass distribution by size. Catch per unit of effort was higher for electrofishing at 25.3 bass per hour than for angling at 4.7 bass per hour. Total processing mortality was 0.35% and the incidence of natural physical deformities or injuries was 10.6%. Feeding incidence averaged 41% with the highest percentage (40.1%) of full stomachs occurring in Summer in 1975. Percent food to body weight was also highest in Summer at 1.2-2.5%. Bass fed opportunistically in 1975 on crustaceans (43.8%), insects (36.0%) and fish (17.8%). Bass movement was limited (<100m) for 82.6% of the population but dramatic redistributions occurred when 1 m temperatures fell below 6.1°C or reached 29.4°C. Winter aggregations were discovered at 3 m depths adjacent to normally high density areas when 1 m temperatures fell below 6.1°C. The length-weight relationship was allometric and defined by $W(g) = 0.000019 \cdot l^{2.9132}(mm)$. K_{TL} values were 1.3-1.5 for bass <0⁺ and back-calculated lengths and weights ranged from 98.0-455.8 mm and 13.3-1049 g for ages 0⁺ - XI⁺. The population was dominated by age class II, which represented 56.41% of the total. Age class survival (II-XI) was 53.2% with an instantaneous mortality rate of 0.561. Total biomass and standing crop values were moderately high at 118.475 kg and 48.576 kg/ha with an area maximum of 115.386 kg/ha. Total production was 36.914 kg contributed by 110.461 kg from age class II. The observed conditions were typical of a stunted population. High biomass and standing crops were concluded to be a function of food and density related ecological factors which optimized production for ages II and younger bass.

LIFE HISTORY-GENERAL WORKS (CONTINUED)

- 84-000355 Karnella, C. THE ECOLOGY OF LANTERNFISHES (MYCTOPHIDAE) IN THE BERMUDA "OCEAN ACRE." Ph.D. dissertation, George Washington Univ. 537p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1335. Nov. 1983. SFA 29(1)
- 84-000356 MacCall, A. D. and G. D. Stauffer. BIOLOGY AND FISHERY POTENTIAL OF JACK MACKEREL (*TRACHURUS SYMMETRICUS*). Calif. Coop. Oceanic Fish. Invest. 24:46-56. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]
- 84-000357 MacCrimmon, H. R.; R. W. Pugsley and B. L. Gots. NATURALIZATION OF RAINBOW SMELT, *OSMERUS MORDAX*, IN LAKE SIMCOE, ONTARIO. Can. Field-Nat. 97(2):161-169. Apr.-June 1983. SFA 29(1)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] The Rainbow Smelt (*Osmerus mordax*), naturalized in Lake Simcoe from *circum* 1960, is now an important component in the sport fishery. Estimated annual winter angling harvest increased from three smelt in 1962 to a peak of 234865 fish in 1973, but has since been lower. Spring spawning runs were first noted in 1965, with peak numbers being taken by sport fishermen from 1970 to 1974. The structure of the spawning population has shown a change in dominance from age group I to III in 1965, to age groups II to IV in 1972, and almost exclusively to age groups II to III in later years. Mean total length for fish in age groups I to III declined from 1965 to 1970, but since that time growth rate has remained relatively constant. Fecundity, significantly related to total length ($P < 0.01$), ranged from 4000 to 58100 eggs. Most spawning in each year normally took place at night in the gravel riffles of tributary streams (190 eggs cm^{-2}) at water temperatures of 7 to 11°C. Some spawning (1-2 eggs cm^{-2}) also occurred along the lake shore at water temperatures of 5 to 7°C. Growth of the smelt population has been concurrent with increased eutrophication of Lake Simcoe and a decline in Lake Whitefish (*Coregonus clupeaformis*) and Lake Trout (*Salvelinus namaycush*) fisheries.
- 84-000358 Mason, J. C.; R. J. Beamish and G. A. McFarlane. SEXUAL MATURITY, FECUNDITY, SPAWNING, AND EARLY LIFE HISTORY OF SABLEFISH (*ANOPILOPOMA FIMBRIA*) OFF THE PACIFIC COAST OF CANADA. Can. J. Fish. Aquatic Sci. 40(12):2126-2134. Dec. 1983. In English with French summ. SFA 29(1)
[Dep. Fish. Oceans, Fish. Res. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]
- 84-000359 Milton, D. A. and A. H. Arthington. REPRODUCTION AND GROWTH OF *CRATEROCEPHALUS MARJORIAE* AND *C. STERCUSMUSCARUM* (PISCES: ATERINIDAE) IN SOUTH-EASTERN QUEENSLAND, AUSTRALIA. Freshwater Biol. 13(6):589-597. Dec. 1983. SFA 29(1)
[A. H. Arthington: Sch. Aust. Environ. Stud., Griffith Univ., Nathan 4111, Australia]
- 84-000360 Moriarty, C. THE AFRICAN PIKE *HEPSETUS ODOE*. Nigerian Field 47(4):212-221. Aug. 1983. SFA 29(1)
[Dep. Wildl. Fish. Manage., Univ. Ibadan, Nigeria]
- 84-000361 Padrón, F. G.; A. P. Martínez; M. Peñáz and M. Prokeš. MICROPTERUS SALMOIDES IN CUBA. Acta Sci. Nat. Acad. Sci. Bohemoslov. Brno Nov. Ser. 17(8):1-33. 1983. SFA 29(1)

SPORT FISHERY ABSTRACTS

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-000362 Pappantoniou, A. ASPECTS OF THE LIFE HISTORY OF THE CUTLIPS MINNOW *EXOGLOSSUM MAXILLINGUA* (PISCES: CYPRINIDAE). Ph.D. dissertation, Fordham Univ. 276p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2085. Jan. 1984. SFA 29(1)

84-000363 Petrimoulx, H. J. THE LIFE HISTORY AND DISTRIBUTION OF THE ROANOKE BASS *AMBLOPLITES CAVIFRONS* COPE, IN VIRGINIA. *Am. Midl. Nat.* 110(2):338-353. Oct. 1983. SFA 29(1)

[Environmental Resources Management, Inc., 999 West Chester Pike, P.O. Box 357, West Chester, PA 19380] The life history and Virginia distribution of the Roanoke bass *Ambloplites cavifrons* Cope was studied from January 1979 through January 1980. Populations in the Roanoke and Chowan drainages were disjunct and locally uncommon, possibly owing to the patchiness of suitable physical habitat. Growth of male and female Roanoke bass was similar and significantly greater ($P < 0.05$) when compared with northern rock bass *Ambloplites rupestris* and redbreast sunfish *Lepomis auritus*. Ponderal indices were similar for both sexes and age dependent. Young *A. cavifrons* consumed small aquatic invertebrates; juveniles included crayfish and fish in the diet; adults ate predominantly crayfish. Seasonal diet variation was greater among juveniles than adults. Maturity occurred at age II if 150 mm TL and 75 g body weight had been attained. The reproductive season extended from May through June as water temperatures approached 20C. Fecundity estimates exhibited a linear relationship to length and weight. Evidence of widespread year-class failure in 1978 and 1979 was attributed to adverse spring stream conditions. Ecological and environmental impacts have caused a recent decline in Roanoke bass abundance, warranting the species the conservation status of Special Concern.

84-000364 Raleigh, R. F. HABITAT SUITABILITY INDEX MODELS: BROOK TROUT. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.24*. 53p. Sept. 1982. From U.S. Government Reports 83(8):1465. 15 Apr. 1983. Available from NTIS as PB83-147041. SFA 29(1)

Literature describing the habitat preferences of the brook trout (*Salvelinus fontinalis*) is reviewed, and the relationships between habitat variables and life requisites are synthesized into a Habitat Suitability Index (HSI) model. HSI models are designed for use with the Habitat Evaluation Procedures in impact assessment and habitat management activities.

84-000365 Ribbink, A. J.; A. C. Marsh; B. A. Marsh and B. J. Sharp. THE ZOOGEOGRAPHY, ECOLOGY AND TAXONOMY OF THE GENUS *LABEOTROPHEUS* AHL, 1927, OF LAKE MALAWI (PISCES: CICHLIDAE). *Zool. J. Linn. Soc.* 79(3):223-243. Nov. 1983. SFA 29(1)

[J. L. B. Smith Inst. Ichthyol., Somerset St., Grahamstown, South Africa]

84-000366 Stuber, R. J. HABITAT SUITABILITY INDEX MODELS: BLACK BULLHEAD. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.14*. 35p. July 1982. From U.S. Government Reports 83(8):1465. 15 Apr. 1983. Available from NTIS as PB83-147025. SFA 29(1)

This is one of a series of publications that provide information on the habitat requirements of selected fish and wildlife species. Literature describing the relationship between habitat variables related to life requisites and habitat suitability for the Black bullhead (*Ictalurus melas*) are synthesized. These data are subsequently used to develop Habitat Suitability (HSI) models. The HSI models are designed to provide information that can be used in impact assessment and habitat management.

SPORT FISHERY ABSTRACTS

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-000367 Stuber, R. J.; G. Gebhart and O. E. Maughan. HABITAT SUITABILITY INDEX MODELS: GREEN SUNFISH. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.15*. 38p. July 1982. From U.S. Government Reports 83(8):1465. 15 Apr. 1983. Available from NTIS as PB83-148205. SFA 29(1)

This is one of a series of publications that provide information on the habitat requirements of selected fish and wildlife species. Literature describing the relationship between habitat variables related to life requisites and habitat suitability for the Green sunfish (*Lepomis cyanellus*) are synthesized. These data are subsequently used to develop Habitat Suitability (HSI) models. The HSI models are designed to provide information that can be used in impact assessment and habitat management.

84-000368 Taniuchi, T.; N. Kuroda and Y. Nose. [AGE, GROWTH, REPRODUCTION, AND FOOD HABITS OF THE STAR-SPOTTED DOGFISH *MUSTELUS MANAZO* COLLECTED FROM CHOSHI.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1325-1334. Sept. 1983. In Japanese with English summ. SFA 29(1)

[Fac. Agric., Univ. Tokyo, Yayoi, Bunkyo, Tokyo 113, Japan]

84-000369 Werner, U. *CICHLASOMA SAJICA*--THE SMALLEST *CICHLASOMA*. *Trop. Fish Hobbyist* 32(5):44-48. Jan. 1984. SFA 29(1)

84-000370 Widlak, J. C. and R. J. Neves. LIFE HISTORY ASPECTS OF THE REDLINE DARTER, *ETHEOSTOMA RUFINELINEATUM*, IN THE NORTH FORK HOLSTON RIVER, VIRGINIA. *Va. J. Sci.* 34(3):136. 1983. Abstract only. SFA 29(1)

[Va. Coop. Fish. Res. Unit, VPI & SU, Blacksburg, VA 24061] Life history aspects of the redline darter were investigated between May 1981 and May 1982 in the North Fork Holston River, southwestern Virginia. Analysis of scale samples indicated that males grew slightly faster and reached a greater maximum length than females. Estimated annual survival for males and females was 0.44 and 0.33, respectively. Enumeration of stomach contents revealed that aquatic insect larvae were the major food items, dipterans predominating (67%-87%) at all times of the year. Peak feeding over a 24 hour period occurred from early to late afternoon (1600h-2000h). Sex ratios favored males throughout the year, attributable to differential survival and distribution. Age I individuals of both sexes greater than 42 mm TL were sexually mature. Ripe males were collected in March although spawning colors first appeared in December. Ova development began in late February, and spawning occurred in riffle areas from mid-May to mid-August.

84-000371 Williams, J. E. and C. E. Bond. STATUS AND LIFE HISTORY NOTES ON THE NATIVE FISHES OF THE ALVORD BASIN, OREGON AND NEVADA. *Great Basin Nat.* 43(3):409-420. 31 July 1983. SFA 29(1)

[U.S. FWS, Endangered Species Office, 1230 "N" Street, 14th Floor, Sacramento, CA 95814] Three fishes, two species of *Gila*, and an undescribed subspecies of cutthroat trout, are endemic to the Alvord Basin. Historically, the Alvord cutthroat trout, *Salmo clarki* ssp., inhabited the larger creeks of the basin but has been extirpated in pure form because of introgression with introduced rainbow trout, *Salmo gairdneri*. *Gila boraxobius* is restricted to the thermal waters of Borax Lake and its outflows in the northern part of the basin. This species is endangered because of alteration of its fragile habitat. The Alvord chub, *G. alvordensis*, is recorded from 16 localities throughout the basin, including springs, creeks, and reservoirs. Although *G. alvordensis* as a species is not in jeopardy, many populations are small and could be easily eliminated by

SPORT FISHERY ABSTRACTS

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-000371 CONTINUED habitat destruction or by the introduction of exotic fishes. Competition with exotic guppies, *Poecilia reticulata*, has extirpated the Thousand Creek Spring population of Alvord chubs. Both species of *Gila* are opportunistic omnivores, consuming primarily chironomids, microcrustaceans, and diatoms. The Borax Lake chub also consumed large numbers of terrestrial insects, but specialized feeding on molluscs was noted in the West Spring population of Alvord chubs. Borax Lake chubs spawn throughout the year; however, most spawning occurs in early spring. Borax Lake chubs mature at a small size, occasionally less than 30 mm standard length, and seldom live more than one year. Alvord chubs are typically much larger than the Borax Lake species and live at least into their fifth year.

84-000372 Wooley, C. M. and E. J. Crateau. BIOLOGY, POPULATION ESTIMATES, AND MOVEMENT OF NATIVE AND INTRODUCED STRIPED BASS, APALACHICOLA RIVER, FLORIDA. *N. Am. J. Fish. Manage.* 3(4):383-394. 1983. SFA 29(1)
[U.S. FWS, Off. Fish. Assistance, 1612 June Ave., Panama City, FL 32405]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

84-000373 Alvheim, O.; A. Dommasnes; O. Martinsen and S. Tjelmeland. LODDEUNDESØKELSER I BARENTSHAVET VINTEREN 1981. [CAPELIN INVESTIGATIONS IN THE BARENTS SEA DURING THE WINTER 1981.] *Fisken Havet* 1983(2):1-10. 1983. In Norwegian with English summ. SFA 29(1)
[Inst. Mar. Res., Bergen, Norway]

84-000374 Alvheim, O.; A. Dommasnes and O. Martinsen. LODDEUNDESØKELSER VINTEREN 1982. [CAPELIN INVESTIGATIONS DURING THE WINTER 1982.] *Fisken Havet* 1983(2):11-24. 1983. In Norwegian with English summ. SFA 29(1)
[Inst. Mar. Res., Bergen, Norway]

84-000375 Askland, M. ACOUSTIC ABUNDANCE ESTIMATION OF THE SPAWNING COMPONENT OF THE LOCAL HERRING STOCK IN LINDAASPOLLENE, WESTERN NORWAY. *Fiskeridir. Skr. Ser. Havunders.* 17(8):297-334. 1983. SFA 29(1)
[Dep. Fish. Biol., Univ. Bergen, Norway]

84-000376 Cohen, J. E.; S. W. Christensen and C. P. Goodyear. A STOCHASTIC AGE-STRUCTURED POPULATION MODEL OF STRIPED BASS (*MORONE SAXATILIS*) IN THE POTOMAC RIVER. *Can. J. Fish. Aquatic Sci.* 40(12):2170-2183. Dec. 1983. In English with French summ. SFA 29(1)
[Rockefeller Univ., 1230 York Ave., New York, NY 10021]

84-000377 Cook, R. C. SIMULATION AND APPLICATION OF STOCK COMPOSITION ESTIMATORS. *Can. J. Fish. Aquatic Sci.* 40(12):2113-2118. Dec. 1983. In English with French summ. SFA 29(1)
[Int. Pac. Halibut Comm., P.O. Box 30, New Westminster, BC V3L 4X9, Canada]

SPORT FISHERY ABSTRACTS

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-000378 Francis, R. C. POPULATION AND TROPHIC DYNAMICS OF PACIFIC HAKE (*MERLUCCIIUS PRODUCTUS*). *Can. J. Fish. Aquatic Sci.* 40(11):1925-1943. Nov. 1983. In English with French summ. SFA 29(1)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-000379 Garman, G. C. and T. F. Waters. USE OF THE SIZE-FREQUENCY (HYNES) METHOD TO ESTIMATE ANNUAL PRODUCTION OF A STREAM FISH POPULATION. *Can. J. Fish. Aquatic Sci.* 40(11):2030-2034. Nov. 1983. In English with French summ. SFA 29(1)
[Me. Coop. Fish. Res. Unit, Univ. Me., Orono 04469]

84-000380 Hamley, J. M.; T. P. Howley and A. L. Punhani. ESTIMATING LARVAL FISH ABUNDANCES FROM PLANKTON NET CATCHES IN LONG POINT BAY, LAKE ERIE, IN 1971-1978. *J. Great Lakes Res.* 9(4):452-467. 1983. SFA 29(1)
[Nanticoke Fish Stud., Ontario Minist. Nat. Resour., P.O. Box 429, Port Dover, ON N0A 1N0, Canada]

84-000381 Hewitt, R. P. and G. D. Brewer. NEARSHORE PRODUCTION OF YOUNG ANCHOVY. *Calif. Coop. Oceanic Fish. Invest.* 24:235-244. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

84-000382 Hoekstra, T. W.; D. E. Chalk; C. L. Hawkes and S. A. Miller. MONITORING REGIONAL WILDLIFE AND FISH HABITATS AND POPULATIONS FOR NATIONAL ASSESSMENTS AND APPRAISALS. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 48:308-314. 1983. SFA 29(1)
[U.S. For. Serv., Rocky Mountain For. Range Exp. Stn., Fort Collins, CO 80521]

84-000383 Jacobs, K. E. and W. D. Swink. FISH ABUNDANCE AND POPULATION STABILITY IN A RESERVOIR TAILWATER AND AN UNREGULATED HEADWATER STREAM. *N. Am. J. Fish. Manage.* 3(4):395-402. 1983. SFA 29(1)
[W. D. Swink: USFWS, Hammond Bay Biol. Stn., RFD Box 441, Millersburg, MI 49759]

84-000384 Malmqvist, B. GROWTH, DYNAMICS, AND DISTRIBUTION OF A POPULATION OF THE BROOK LAMPREY *LAMPETRA PLANERI* IN A SOUTH SWEDISH STREAM. *Holarctic Ecol.* 6(4):404-412. Oct. 1983. SFA 29(1)
[Dep. Anim. Ecol., Univ. Lund, Ecol. Bldg., S-223 62 Lund, Sweden] Size and structure of a South Swedish population of *Lampetra planeri* larvae were studied during 5 yr. Population size fluctuated considerably within the studied section of stream with a general decline. The fluctuations were positively and strongly correlated (multiple $R^2 = 0.85$) with the population density at the beginning of each analysed period, while poorly correlated with such variables as heavy precipitation and temperature. Several factors suggest the entire larval population drifts downstream: fluctuations in the studied stream section, increasing mean size downstream, and incongruity in longitudinal distribution in surveys, performed with a 5-yr interval. Growth, estimated both in caged larvae and from length frequency data, occurred mainly in autumn. High density in cages reduced the growth rate of larvae.

SPORT FISHERY ABSTRACTS

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-000385 Picquelle, S. J. and R. P. Hewitt. THE NORTHERN ANCHOVY SPAWNING BIOMASS FOR THE 1982-83 CALIFORNIA FISHING SEASON. *Calif. Coop. Oceanic Fish. Invest.* 24:16-28. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

84-000386 Rodríguez, A. ANÁLISIS DE COHORTES SEMESTRAL (1972-1978) DE LA PESQUERÍA CUBANA DE "BONITO" (*KATSUWONUS PELAMIS*). [ANALYSIS OF THE SEMI-ANNUAL COHORTS (1972-1978) OF THE CUBAN FISHERY FOR SKIPJACK (*KATSUWONUS PELAMIS*).] *Rev. Cubana Invest. Pesq.* 5(1):46-65. 1980. In Spanish with English summ. SFA 29(1)
[Flota Atunera de Cuba, Cuba]

84-000387 Sano, N. and Y. Tanino. STUDY FOR ESTIMATING THE EXISTENT AMOUNT OF SAURY RESOURCES BY MEANS OF SCIENTIFIC ECHO SOUNDER TECHNIQUES. *Bull. Fac. Fish. Hokkaido Univ.* 34(3):220-230. Aug. 1983. In Japanese with English summ. SFA 29(1)
[Lab. Instrument Eng. Fish., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

84-000388 Serns, S. L. RELATIONSHIP BETWEEN ELECTROFISHING CATCH PER UNIT EFFORT AND DENSITY OF WALLEYE YEARLINGS. *N. Am. J. Fish. Manage.* 3(4):451-452. 1983. SFA 29(1)
[Wis. Dep. Nat. Resour., Box 440, Woodruff 54568]

84-000389 Squire, J. L., Jr. ABUNDANCE OF PELAGIC RESOURCES OFF CALIFORNIA, 1963-78, AS MEASURED BY AN AIRBORNE FISH MONITORING PROGRAM. *NOAA Tech. Rep. NMFS SSRF* 762. v + 75p. Feb. 1983. SFA 29(1)
[NMFS, La Jolla, CA 92038]

84-000390 Wilcock, J. A. and D. N. McBride. ORIGINS OF CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA WALBAUM*) IN THE YUKON RIVER FISHERIES 1982. *Alaska Dep. Fish Game Inf. Leafl.* No. 226. iii + 36p. Nov. 1983. SFA 29(1)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau 99802]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

84-000391 Burr, B. M. and R. C. Heidinger. REPRODUCTIVE BEHAVIOR OF THE BIGMOUTH BUFFALO *ICTIOBUS CYPRINELLUS* IN CRAB ORCHARD LAKE, ILLINOIS. *Am. Midl. Nat.* 110(1):220-221. July 1983. SFA 29(1)
[Dep. Zool., South. Ill. Univ., Carbondale 62901] Spawning of *Ictiobus cyprinellus* occurred 24-26 April 1982 at water temperatures of 18-20 C in water 0.5-0.75 m deep in Crab Orchard Lake, Williamson Co., Illinois. Spawning was accomplished in groups of three or more individuals (usually two tuberculate males aligned alongside one female) and involved a "rush" along the water surface. Spawners then sank to the bottom, occasionally assuming a vertical posture with their tails exposed. Adhesive eggs were scattered over decaying vegetation and were left unattended.

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-000392 Demski, L. S. and J. G. Dulka. UNDERWATER OBSERVATIONS ON COLOR PATTERNS AND SPAWNING IN A SYNCHRONOUS HERMAPHRODITIC SEA BASS. *Am. Zool.* 23(4):881. 1983. Abstract only. SFA 29(1)
[Univ. Ky., Lexington]

84-000393 Fiedler, P. C. SATELLITE REMOTE SENSING OF THE HABITAT OF SPAWNING ANCHOVY IN THE SOUTHERN CALIFORNIA BIGHT. *Calif. Coop. Oceanic Fish. Invest.* 24:202-209. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

84-000394 Geevarghese, C. and P. A. John. MATURATION AND SPAWNING OF A GOBIID FISH, *OLIGOLEPIS ACUTIPENNIS* (CUV. & VAL.), FROM THE SOUTH-WEST COAST OF INDIA. *J. Fish Biol.* 23(6):611-624. Dec. 1983. SFA 29(1)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Beach P.O., Trivandrum 695 007, India]

84-000395 Goodyear, C. D.; T. A. Edsall; D. M. O. Dempsey; G. D. Moss and P. E. Polanski. ATLAS OF THE SPAWNING AND NURSERY AREAS OF GREAT LAKES FISHES. *U.S. Fish Wildl. Serv. FWS/OBS-82/52.* Sept. 1982. 14 vol. From U.S. Government Reports 83(10):2138. 13 May 1983. Available from NTIS as PB83-157313. SFA 29(1)

84-000396 Grier, H. J.; J. S. Smith and C. Zahnow. ASYNCHRONOUS ANNUAL REPRODUCTIVE CYCLES BETWEEN THE ATHERINIFORM TELEOSTS *FUNDULUS GRANDIS* (CYPRINODONTIDAE) AND *POECILIA LATIPINNA* (POECILIIDAE). *Am. Zool.* 23(4):1022. 1983. Abstract only. SFA 29(1)

[Dep. Biol., Univ. South Fla., Tampa] Annual reproductive cycles of *F. grandis* and *P. latipinna* were monitored in a St. Petersburg estuary. Peak reproductive activity in *F. grandis* occurred from March through April and ceased by the end of May. Only nonreproductive *F. grandis* were sampled during the summer and fall. Reproduction in *P. latipinna* began between January and March, extended through the summer and ceased during late August and September. Reproductive activity in *P. latipinna* coincided with annual changes in daylength whereas that of *F. grandis* did not. Laboratory experiments indicate long photoperiod (16L:8D) stimulate reproduction in *P. latipinna* while short photoperiod (8L:16D) inhibits reproduction. Temperature is the apparent major environmental cue controlling reproduction in *F. grandis*. In closely related teleost species, annual reproductive cycles may be controlled by different environmental factors.

84-000397 Hughes, A. L. MALE SIZE, MATING SUCCESS, AND MATING STRATEGY IN THE MOSQUITOFISH, *GAMBUSIA AFFINIS* (POECILIIDAE). *Am. Zool.* 23(4):881. 1983. Abstract only. SFA 29(1)

[Indiana Univ., Bloomington] In mosquitofish populations in southern Indiana, males maturing in early summer do so at small body sizes. Those maturing in late summer delay maturation, attaining larger body sizes. Laboratory experiments showed that females tend to prefer the larger of two males and that larger males can outcompete smaller males for access to females. One hypothetical advantage for early summer males of small body size is that it enables the male to employ energetically costly mating strategies such as the pursuit and forcible insemination of nonreceptive females. Experiments confirmed the prediction that small males are more likely to

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-000397 CONTINUED employ the strategy of pursuit when confronted with a nonreceptive female, while large males are likely to continue courtship. An ethological assay of seasonal changes in female receptivity showed that females are least receptive in mid-summer, when smaller males are abundant.

84-000398 Keenleyside, M. H. A. MATE DESERTION IN RELATION TO ADULT SEX RATIO IN THE BIPARENTAL CICHLID FISH *HEROTILAPIA MULTISPINOSA*. *Anim. Behav.* 31(3):683-688. 1983. SFA 29(1)

[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] Mate desertion and pair bond instability were assessed among *Herotilapia multispinosa* held in outdoor ponds at three different adult sex ratios. Brood-guarding males frequently deserted their mates and broods in the presence of a surplus of females. Female parents did not desert their mates, regardless of the sex ratio. Several other measures also indicated a reduced pair bond stability associated with a female surplus. The capacity of males to re-spawn at shorter intervals than females may account for these results.

84-000399 Kleckner, R. C.; J. D. McCleave and G. S. Wippelhauser. SPAWNING OF AMERICAN EEL, *ANGUILLA ROSTRATA*, RELATIVE TO THERMAL FRONTS IN THE SARGASSO SEA. *Environ. Biol. Fishes* 9(3-4):289-293. 1 Dec. 1983. SFA 29(1)

[Dep. Zool., Univ. Me., Orono 04469]

84-000400 Kodric-Brown, A. DETERMINANTS OF MALE REPRODUCTIVE SUCCESS IN PUFFFISH (*CYPRINODON PECOSSENSIS*). *Anim. Behav.* 31(1):128-137. Feb. 1983. SFA 29(1)

[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson 85721]

84-000401 Merritt, M. F. and K. Roberson. MIGRATORY TIMING OF UPPER COPPER RIVER SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) STOCKS, AND ITS MANAGEMENT IMPLICATIONS TO THE COMMERCIAL FISHERY. *Alaska Dep. Fish Game Inf. Leafl.* No. 225. iv + 39p. Oct. 1983. SFA 29(1)

[Alaska Dep. Fish Game, Div. Commer. Fish., Glennallen]

84-000402 Neil, S. J. CONTESTS FOR SPACE IN BREEDING *CICHLASOMA MEEKI*: THE ROLE OF RESOURCE HOLDING POTENTIAL. *Behaviour* 87(3-4):270-282. 1983. In English with German summ. SFA 29(1)

[Dep. Zool., Queen's Univ. Belfast, Belfast BT7 1NN, Northern Ireland]

84-000403 Neil, S. J. CONTESTS FOR SPACE IN BREEDING *CICHLASOMA MEEKI*: THE USE OF INCREASED APPARENT SIZE DISPLAYS. *Behaviour* 87(3-4):283-297. 1983. In English with German summ. SFA 29(1)

[Dep. Zool., Queen's Univ. Belfast, Belfast BT7 1NN, Northern Ireland]

84-000404 Noonan, K. C. FEMALE MATE CHOICE IN THE CICHLID FISH *CICHLASOMA NIGROFASCIATUM*. *Anim. Behav.* 31(4):1005-1010. Nov. 1983. SFA 29(1)

[Dep. Zool., Univ. Wis., Madison 53706] Male body size (standard length) and prior reproductive experience were tested for their influence on the mate choice of naive female convict cichlid fish, *Cichlasoma*

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-000404 CONTINUED *nigrofasciatum*. Females showed no preference based on male reproductive experience, but significantly preferred the larger of two males. The possibility that the size dimorphism is a sexually-selected trait in male *C. nigrofasciatum* is discussed. Individual broods of *C. nigrofasciatum* were reared and sexually mature animals measured to determine the relationship between sex, age and size. Males of the same age showed sufficient size variation to serve as a basis for female choice. Thus the size variation necessary for selection to operate exists in male *C. nigrofasciatum*. These data suggest that male body size may be a sexually-selected trait in this monogamous cichlid species.

84-000405 Petersen, C. W. REPRODUCTIVE STRATEGIES IN A SIMULTANEOUSLY HERMAPHRODITIC REEF FISH, *SERRANUS FASCIATUS*. *Am. Zool.* 23(4):880. 1983. Abstract only. SFA 29(1)
[Univ. Ariz., Tucson]

84-000406 Robertson, D. R. ON THE SPAWNING BEHAVIOR AND SPAWNING CYCLES OF EIGHT SURGEONFISHES (ACANTHURIDAE) FROM THE INDO-PACIFIC. *Environ. Biol. Fishes* 9(3-4):193-223. 1 Dec. 1983. SFA 29(1)
[Smithsonian Trop. Res. Inst., Apt. 2072, Balboa, Panama]

84-000407 Scoppettone, G. G.; G. A. Wedemeyer; M. Coleman and H. Burge. REPRODUCTION BY THE ENDANGERED CUI-UI IN THE LOWER TRUCKEE RIVER. *Trans. Am. Fish. Soc.* 112(6):788-793. Nov. 1983. SFA 29(1)
[U.S. FWS, Great Basin Complex Off., 4600 Kietzke Lane, Reno, NV 89502]

84-000408 Scott, J. S. INFERRED SPAWNING AREAS AND SEASONS OF GROUND FISHES ON THE SCOTIAN SHELF. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1219. iii + 14p. Oct. 1983. SFA 29(1)
[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

84-000409 Thresher, R. E. and J. T. Moyer. MALE SUCCESS, COURTSHIP COMPLEXITY AND PATTERNS OF SEXUAL SELECTION IN THREE CONGENERIC SPECIES OF SEXUALLY MONOCHROMATIC AND DICHROMATIC DAMSELFISHES (PISCES: POMACENTRIDAE). *Anim. Behav.* 31(1):113-127. Feb. 1983. SFA 29(1)
[J. T. Moyer: Tatsuo Tanaka Mem. Biol. Stn., Ako, Miyake-jima, Izu Islands, Japan 100-12]

84-000410 Trendall, J. T. LIFE HISTORY VARIATION AMONG EXPERIMENTAL POPULATIONS OF THE MOSQUITOFISH, *GAMBUSIA AFFINIS*. *Copeia* 1983(4):953-963. 14 Dec. 1983. SFA 29(1)
[Duke Univ. Mar. Lab., Beaufort, NC 28516]

84-000411 Waas, B. P. and K. Strawn. SEASONAL AND LUNAR CYCLES IN GONADOSOMATIC INDICES AND SPAWNING READINESS OF *FUNDULUS GRANDIS*. *Contrib. Mar. Sci.* 26:127-141. Sept. 1983. SFA 29(1)
[Dep. Zool., Univ. Colombo, Colombo 3, Sri Lanka]

84-000412 Weeks, H. J. ROCKY TIDEPOOL REPRODUCTIVE ECOLOGY OF THE THREESPINE STICKLEBACK. *Am. Zool.* 23(4):1022. 1983. Abstract only. SFA 29(1)
[Cornell Univ., Ithaca, NY]

SPORT FISHERY ABSTRACTS

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-000413 Wirtz, P. THE REPRODUCTIVE BEHAVIOUR OF THREE BLENNOID FISH ENDEMIC TO THE GALAPAGOS ISLANDS. *Not. Galapagos* No. 37. p. 26-27. 1983. SFA 29(1)

[Inst. Biol., Albertstr. 219, 78 Freiburg, West Germany]

84-000414 Witzel, L. D. and H. R. MacCrimmon. REDD-SITE SELECTION BY BROOK TROUT AND BROWN TROUT IN SOUTHWESTERN ONTARIO STREAMS. *Trans. Am. Fish. Soc.* 112(6):760-771. Nov. 1983. SFA 29(1)

[Ontario Minist. Nat. Resour., Port Dover, ON N0A 1N0, Canada]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

84-000415 Blacker, R. W. PELAGIC RECORDS OF THE LUMPSUCKER, *CYCLOPTERUS LUMPUS* L. *J. Fish Biol.* 23(4):405-417. Oct. 1983. SFA 29(1)

[Minist. Agric. Fish. Food, Dir. Fish. Res., Fish. Lab., Loewstoft, Suffolk NR33 OHT, England]

84-000416 Downey, P. and D. Toetz. DISTRIBUTION OF LARVAL GIZZARD SHAD (*DOROSOMA CEPEDIANUM*) IN LAKE CARL BLACKWELL, OKLAHOMA. *Am. Midl. Nat.* 109(1):23-33. Jan. 1983. SFA 29(1)

[Box 747, Ouachita Baptist Univ., Arkadelphia, AR 71923] Year-class formation in fishes is poorly understood because of the difficulty of estimating abundance of fish larvae. The purpose of the research was to describe the temporal and spatial distribution of gizzard shad larvae (*Dorosoma cepedianum*) in Lake Carl Blackwell (LCB), Oklahoma, to provide a basis for future efforts at sampling larvae of this important forage fish in reservoirs. Larvae were sampled with a net (mouth 0.20 m²) towed in front of a boat at night at depths of 0 (surface), 3, 5 and 7 m between April and July 1977. Wind direction and velocity, cited by other workers as decisive in determining fish larval distribution, were related to patterns of larval abundance. Larvae were captured by the gear at a length of ca. 5 mm, but were not captured after they reached slightly more than 15 mm about 10 weeks later. Larval density was highest ca. 100 m⁻³ during late May and early June. Larvae were captured near the surface at the outset and were apparently passively distributed by winds. However, the rest of the time they were most abundant at 3 m, near the compensation point, suggesting maintenance of a preferred position in the water column. Estimates of larval shad density taken offshore were the same as estimates nearshore in areas of the lake with either very high or low densities. The dendritic configuration of the lake basin precluded prediction of horizontal or vertical patterns of distribution of shad larvae. We conclude that accurate estimates of density will be possible only by intensively sampling all areas of the lake throughout the season. Therefore, it is likely that stratified random sampling programs for shad larvae are not now reasonable for dendritic lakes such as LCB.

84-000417 Mace, J. T. and A. D. Johnston. TAGGING EXPERIMENTS ON BLUE COD (*PARAPERCIS COLIAS*) IN THE MARLBOROUGH SOUNDS, NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 17(3):207-211. 1983. SFA 29(1)

[Fish. Manage. Div., Minist. Agric. Fish., Private Bag, Nelson, New Zealand] From 1973 to 1976, 2430 blue cod (*Parapercis colias*) were tagged in the Marlborough Sounds. Tags from 84 fish (3.5%) were returned after a mean 138 days at liberty. Of these, 71.6% had not moved significant distances. The remainder had travelled up to 41.7 km. Tag shedding rates, as indicated by multiple-tagging experiments, were high. Results suggest that

SPORT FISHERY ABSTRACTS

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

84-000417 CONTINUED blue cod of the Marlborough Sounds and the adjacent islands belong to the same stock, and that, while some move significant distances, the majority stay in 1 place for extended periods.

84-000418 Nicholas, J. W. and L. Van Dyke. STRAYING OF ADULT COHO SALMON TO AND FROM A PRIVATE HATCHERY AT YAQUINA BAY, OREGON. *Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep.* 82-10. i + 16p. Dec. 1982. SFA 29(1)
[Oreg. Dep. Fish Wildl., P.O. Box 3503, Portland 97208]

84-000419 Perrone, M., Jr.; P. J. Schneeberger and D. J. Jude. DISTRIBUTION OF LARVAL YELLOW PERCH (*PERCA FLAVESCENS*) IN NEARSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN. *J. Great Lakes Res.* 9(4):517-522. 1983. SFA 29(1)

[Great Lakes Res. Div., Univ. Mich., Ann Arbor 48109] Spatial and temporal distribution of larval yellow perch (*Perca flavescens*) in southeastern Lake Michigan was described from samples collected during 1973-1981 with plankton nets and benthic sleds in water 0.5 to 21 m deep. Yellow perch larvae ≤ 7.5 mm total length were numerous from mid-May to early or mid-July. Larvae taken before mid-June hatched from eggs spawned in inland waters, rather than in Lake Michigan. Those larvae appearing early occurred chiefly in shallow water (≤ 1.5 m), whereas larvae caught later were chiefly distributed in deeper water (≥ 6 m). Larval perch abundance was similar at all bottom depths ≥ 6 m, was low in surface water during the day, and low near bottom at night. At 0.5- and 1.5-m stations, significantly more larvae were caught at night than during the day.

84-000420 Pflug, D. E. and G. B. Pauley. THE MOVEMENT AND HOMING OF SMALLMOUTH BASS, *MICROPTERUS DOLOMIEUI*, IN LAKE SAMMAMISH, WASHINGTON. *Calif. Fish Game* 69(4):207-216. Oct. 1983. SFA 29(1)

[R. W. Beck & Assoc., Tower Bldg., 7th and Olive Way, Seattle, WA 98101] Smallmouth bass were tagged and released at new locations between 0.8 to 11.3 km away from the initial capture location on the lake. The recaptured bass showed a homing tendency with 41% returning to the site of capture, 38% were apparently on their way back to the point of capture, and only 21% showed a sedentary response by staying in the new release area. Smallmouth tagged and released at the site of capture showed a definite affinity for a home area, with 81% recaptured in the area of capture and release. Of the 19% that moved out of this area, 4.8 km was the farthest distance any fish moved. The home range tendency of smallmouth bass has potential management implications when considering expanding a smallmouth fishery within a large lake, when stocking a lake for the first time with smallmouth bass, or when evaluating bass tournament release procedures.

84-000421 Russell, D. J. and R. N. Garrett. USE BY JUVENILE BARRAMUNDI, *LATES CALCARIFER* (BLOCH), AND OTHER FISHES OF TEMPORARY SUPRALITTORAL HABITATS IN A TROPICAL ESTUARY IN NORTHERN AUSTRALIA. *Aust. J. Mar. Freshwater Res.* 34(5):805-811. 1983. SFA 29(1)

[North. Fish. Res. Cent., Dep. Primary Indus., c/-Post Office, Bungalow, Queensland 4870, Australia] Use by fishes of temporary pools created by high seasonal tides, which occur each year from October until April, on the saltpans and littorals adjacent to the Norman River estuary in northern Queensland was investigated. Fish entering the pools were sampled with one-way tidal traps placed in inlet gutters, and fish in the pools were poisoned using rotenone. Recruitment to the pools by fish occurred soon after the initial tidal inundation. Juvenile fish of 37 species, including the commercially important food fish *L. calcarifer*, used the pools. The first barramundi were found 8 weeks after initial inundation and for the remainder of the study they continually migrated into these habitats. The

SPORT FISHERY ABSTRACTS

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

84-000421 CONTINUED total length of the smallest *L. calcarifer* sampled was 9.5 mm. Salinities in pools containing fish ranged from 94×10^{-3} to less than 1×10^{-3} and temperatures reached 36°C .

84-000422 Squire, J. L., Jr. and D. V. Nielsen. RESULTS OF A TAGGING PROGRAM TO DETERMINE MIGRATION RATES AND PATTERNS FOR BLACK MARLIN, *MAKAIRA INDICA*, IN THE SOUTHWEST PACIFIC OCEAN. NOAA Tech. Rep. NMFS SSFR 772. iii + 19p. July 1983. SFA 29(1)

[NMFS, La Jolla, CA 92038] Marine game fish anglers reported tagging a total of 2,576 black marlin, *Makaira indica*, from 1968 through 1978 near the Great Barrier Reef, north Queensland, Australia, as part of the National Marine Fisheries Service Cooperative Marine Game Fish Tagging Program--Pacific Area. Sixty tagged black marlin were recaptured during an 11-year period for a recapture rate of 2.3%. Average weight of black marlin tagged was estimated to be 175 kg (385 lb). Anglers tend to overestimate weight at time of tagging and short-term recaptures (0-60 days) indicate an average angler overestimate of 16 kg (35 lb) per marlin. Sex was determined for 28 recaptures; 25 (89%) were reported as males and 3 (11%) reported as females. Average weight of males at recapture was 91 kg (195 lb), for females, 221 kg (488 lb). Vector analysis of time, distance, and direction data for tag recovery locations indicated migration direction (vector mean bearing) and distance (vector mean distance from point of tagging) by periods of release time: 0-60 days, $121^{\circ}/72$ nmi, 61-120 days, $134^{\circ}/446$ nmi, 121-240 days, $097^{\circ}/1,256$ nmi. The greatest distance (2,100 nmi) recorded from the point of tagging was for a black marlin recaptured northeast of New Zealand, 235 days after tagging. Black marlin tagged early in the north Queensland fishing season (September) tended to migrate away from the area of tagging at a lower rate for the first 0-60 day period than black marlin tagged in October, November, or later in the fishing season. Tag recoveries were made near the tagging location 1, 2, and 4 years after tagging. Locations of recapture for these black marlin were calculated to be a vector mean distance of 58.3 nmi from the point of tagging. Longline high catch rate areas for black marlin indicate a monthly movement for the first 240 days of release time not unlike that observed by tagging. In the summer the centers of high catch rate show a south to southeast movement off the east coast of Australia from the tagging area, then a northward movement in the winter and spring to the New Guinea-Bismark Archipelago-Solomon Islands area. The amount of interchange with the Indo-Pacific and areas to the north is unclear, although emigration from the tagging area to north of New Guinea was recorded.

84-000423 Youngson, A. F.; R. J. G. Buck; T. H. Simpson and D. W. Hay. THE AUTUMN AND SPRING EMIGRATIONS OF JUVENILE ATLANTIC SALMON, *SALMO SALAR* L., FROM THE GIRNOCK BURN, ABERDEENSHIRE, SCOTLAND: ENVIRONMENTAL RELEASE OF MIGRATION. *J. Fish Biol.* 23(6):625-639. Dec. 1983. SFA 29(1)

[Mar. Lab., Aberdeen, Scotland] Peaks in the emigratory activity of sexually immature, juvenile Atlantic salmon, *Salmo salar*, occur in autumn and early winter and in spring at the Girnock Burn in Aberdeenshire. Stream temperature is apparently without effect on the release of potentially emigrant fish from the stream. Migrants tend to leave the stream when stream discharge rate is elevated. Whereas downstream movements in autumn and the earlier part of the spring are made almost invariably when the stream's discharge rate is higher than the seasonal norm, later in spring they often occur when discharge rates are lower than the seasonal norm and when no apparent increase in absolute stream discharge rate has occurred. Emigration is depressed in the lunar quarter centred on the full moon. The nature of the relationship between the autumn and spring emigrations is discussed.

FOODS/FEEDING

84-000424 Anderson, O. THE FORAGING BEHAVIOUR OF LARGEMOUTH BASS IN STRUCTURED ENVIRONMENTS. *Ph.D. dissertation, Mich. State Univ.* 159p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2056. Jan. 1984. SFA 29(1)

84-000425 Bagarinao, T. and J. R. Hunter. THE VISUAL FEEDING THRESHOLD AND ACTION SPECTRUM OF NORTHERN ANCHOVY (*ENGRAULIS MORDAX*) LARVAE. *Calif. Coop. Oceanic Fish. Invest.* 24:245-254. Oct. 1983. In English with Spanish summ. SFA 29(1)

[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] The visual feeding threshold and action spectrum of 10-15-mm northern anchovy larvae were determined, using as criterion the incidence of two or more rotifers in the guts of 50% of larvae tested under different spectral irradiances. The threshold sensitivity to broadband blue-green light is at $0.15 \mu\text{Wcm}^{-2} = 0.61$ lux. The action spectrum shows a maximum in the green wavelengths around 530 nm: the weighted threshold irradiances at various wavelength bands converge at a mean value of $0.14 \mu\text{Wcm}^{-2}$ ^{anch. eff.}. The visual abilities of the anchovy allow them to feed at a depth of 74 m at noon on clear days, and at the surface during twilight and bright nights, and appear to be well adapted to the anchovy's habitat in turbid, greenish coastal waters. Comparisons with younger anchovy larvae show that changes in visual function accompany changes in eye and retinal morphology, specifically the recruitment of rods. Moreover, 10-15-mm anchovy larvae can feed to a limited extent (10%) in the dark when food densities are high (20-40 rotifer/ml). In March, which is the peak spawning season of the anchovy in southern California and Baja California, the 10-15-mm larvae have 13 hours each day to feed.

84-000426 Bemis, W. E. and G. V. Lauder. KINEMATICS AND ELECTROMYOGRAPHY OF FEEDING IN THE LUNGFISH *LEPIDOSIREN PARADOXA*. *Am. Zool.* 23(4):1010. 1983. Abstract only. SFA 29(1)
[Univ. Chicago, Chicago, IL]

84-000427 Bernstein, J. W. and R. J. F. Smith. ALARM SUBSTANCE CELLS IN FATHEAD MINNOWS DO NOT AFFECT THE FEEDING PREFERENCE OF RAINBOW TROUT. *Environ. Biol. Fishes* 9(3-4):307-311. 1 Dec. 1983. SFA 29(1)
[Dep. Vet. Pathol., West. Coll. Vet. Med., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada]

84-000428 Brown, J. A. A COMPARATIVE STUDY OF BEHAVIOURAL ONTOGENY IN FOUR SPECIES OF CENTRARCHID FISH. *Ph.D. dissertation, Queen's Univ. Kingston (Canada)*. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1331. Nov. 1983. SFA 29(1)

The general aim of this study was to expand the relatively narrow base of comparative knowledge of the behavioural ontogeny of fish and to determine the adaptive significance of early behaviour in the life histories of largemouth bass (*Micropterus salmoides*), rock bass (*Ambloplites rupestris*), and pumpkinseed (*Lepomis gibbosus*) and bluegill (*L. macrochirus*) sunfish fry. In the study on the ontogeny of feeding behaviour in these centrarchids, all four species initially displayed five feeding acts: Orientation, Fixate, Lunge, Snap and Bite with Fixate, Lunge, and Snap disappearing from the feeding repertoire at various intervals. The frequency of the acts decreased over time. In the study on the ontogeny of predator-avoidance in largemouth bass and rock bass fry, naive largemouth bass fry displayed a reduced predator-avoidance to large predators for the first three weeks of free-swimming and a reduced avoidance to the small predators for the first two weeks of free-swimming. This reduction could

FOODS/FEEDING (CONTINUED)

84-000428 CONTINUED function to keep the fry in close proximity to the guarding male. Naive rock bass fry avoided both predators throughout the study period. The response of the fry to the small predator changed from avoidance to association as the fry grew. The ontogeny of social behaviour was studied in all four species. Largemouth bass initially aggregated, then swarmed, and finally developed aggressive behaviour between days 45 and 50. Largemouth bass fry formed short-term linear, dominance hierarchies in the laboratory. Aggressive behaviour appeared in rock bass fry between days 36 and 41. Approximately three weeks after the onset of the aggressive behaviour, the fry established territories in the laboratory. Aggressive behaviour appeared in pumpkinseed sunfish fry between days 64 and 71, while for bluegill sunfish fry it appeared between days 53 and 55. Hierarchies were formed by three weeks. All the species spent significantly more time feeding during the first six weeks than later weeks. During a corresponding period in the field the fry are either occupying an area low in predators (offshore) or are being guarded by a male parent, and thus the risk of predation is low. The appearance of social-aggressive behaviour and a well developed predator-avoidance response in laboratory fry coincided closely with the fry's movement to a predator-rich environment in the field. It was obvious that the early behaviour of the three species was associated with events in their early life history and enhances the likelihood of survival of the individuals.

84-000429 Cedillo, R. and L. Ruiz. RELACIONES BIOMETRICAS DE LA LISA *MUGIL CEPHALUS* L. [BIOMETRIC RELATIONS OF *LIZA MUGIL CEPHALUS* L.] An. Cient. (La Molina) 18:101-114. 1980. In Spanish with English summ. SFA 29(1)
[Piscicult. Oceanol., UNA La Molina, Peru]

84-000430 Cerri, R. D. THE EFFECT OF LIGHT INTENSITY ON PREDATOR AND PREY BEHAVIOUR IN CYPRINID FISH: FACTORS THAT INFLUENCE PREY RISK. *Anim. Behav.* 31(3):736-742. 1983. SFA 29(1)

[Dep. Biol., Siena Coll., Londonville, NY 12211] Light intensity has been hypothesized to play a major role in determining the timing and outcomes of predator-prey interactions in aquatic systems. Prey risk is often minimal in bright light and increases at low light levels. This study investigated four possible predator and prey behaviours that relate light intensity to predation rates, using two species of cyprinid fish: *Rhinichthys atratulus* as prey and adult *Semotilus atromaculatus* as predators. I investigated the following four light-related behaviors: prey schooling behaviour, predator activity patterns, detection of predators and evasive responses by prey, and the defensive use of structure in the habitat by prey. The results of this study indicate that prey risk is closely related to predatory activity; aggregating by prey and early detection of predators may play secondary roles.

84-000431 Charlon, N. and J. M. Blanc. ETUDE DES CIVELLES D'*ANGUILLA ANGUILLA* L. DANS LA RÉGION DU BASSIN DE L'ADOUR. 2. RÉGIME ALIMENTAIRE ET VARIATIONS DE QUELQUES CARACTÉRISTIQUES BIOCHIMIQUES EN COURS DE MIGRATION. [A STUDY OF THE ELVERS (*ANGUILLA ANGUILLA* L.) IN THE ADOUR BASIN AREA. 2. FOOD INTAKE AND VARIATIONS OF BIOCHEMICAL CHARACTERISTICS FROM THE OUTSET OF MIGRATION.] *Arch. Hydrobiol.* 98(2):240-249. 1983. In French with English summ. SFA 29(1)

[Cent. Rech. Hydrobiol., B. P. 3, Saint-Pée-sur-Nivelle, 64310 Ascaïn, France] Two types of elvers populations have been studied from October 1979 to August 1980, in South-West France, by periodical samplings along the seaside as well as in the river. Elvers caught at sea are characterized by a vacuity coefficient near 100%, irrespective of the season.

FOODS/FEEDING (CONTINUED)

84-000431 CONTINUED Dry matter, protein and lipid contents are affected by yearly cyclic fluctuations such as those observed in a previous study on biometrical characteristics of length and weight. During the coldest months, scarcely no difference appears between the elvers caught upstream and those previously mentioned. First feeding starts, however, when water temperature is above 10°C (about April), this diet consisting mainly of Chironomids. In summer, dry matter contents remain constant. Growth is characterized by an increase in protein and a decrease in lipid contents.

84-000432 Chartock, M. A. THE ROLE OF *ACANTHURUS GUTTATUS* (BLOCH AND SCHNEIDER 1801) IN CYCLING ALGAL PRODUCTION TO DETRITUS. *Biotropica* 15(2):117-121. June 1983. SFA 29(1)
[Dep. Zool. Sci., Univ. Okla., Norman 73019]

84-000433 Glandt, D. EXPERIMENTELLE UNTERSUCHUNGEN ZUM BEUTE-RÄUBER-VERHÄLTNIS ZWISCHEN STICHLINGEN, *GASTEROSTEUS ACULEATUS* L. UND *PUNGITIUS PUNGITIUS* (L.) (TELEOSTEI), UND GRASFROSCHLARVEN, *RANA TEMPORARIA* L. (AMPHIBIA). [EXPERIMENTS ON THE PREY-PREDATOR RELATIONSHIP BETWEEN STICKLEBACKS, *GASTEROSTEUS ACULEATUS* L. AND *PUNGITIUS PUNGITIUS* (L.) (TELEOSTEI), AND COMMON FROG LARVAE, *RANA TEMPORARIA* L. (AMPHIBIA).] *Zool. Anz.* 211(5-6):277-284. 1983. In German with English summ. SFA 29(1)

[Biol. Inst. Metelen e.V., Forschungseinrichtung für Ethol. Artenschutz, Veröffentlichung Nr. 7 aus dem B.I.M., West Germany] Under well defined laboratory conditions the two stickleback species *Gasterosteus aculeatus* and *Pungitius pungitius* took a high portion of Common frog larvae (*Rana temporaria*) as prey if these larvae were the only kind of prey offered. If the sticklebacks had the choice between *Rana* larvae and more suitable kind of prey (*Tubifex*) both species took only a very low portion of *Rana* larvae as prey. This difference could be confirmed by making analyses of stomach and intestine content. The data obtained lead to the conclusion that under natural conditions (open field) and if there is sufficient food supply of normal prey species, sticklebacks are no serious cause of mortality within larvae populations of *Rana temporaria*.

84-000434 Holmes, R. A. and R. N. Gibson. A COMPARISON OF PREDATORY BEHAVIOUR IN FLATFISH. *Anim. Behav.* 31(4):1244-1255. Nov. 1983. SFA 29(1)

[Geac Computers, Ltd., 1690 Park Avenue, Aztec West, Almondsbury, Bristol BS12 4RA, U.K.] The feeding behaviour of six species of flatfish was examined. Four species of bothids showed very different hunting tactics when feeding on mysids. Seventy per cent of attacks by turbot (*Scophthalmus maximus*) occurred in the water column, compared with only 6% for brill (*Scophthalmus rhombus*), whilst the topknots *Zeugopterus punctatus* and *Phrynorhombus regius* always remained in contact with the substratum. The turbot were agile and rapidly pursued their prey, brill slowly stalked their prey and the topknots employed a 'sit and wait' strategy. When feeding on shrimps, turbot made 90% of their attacks from the substratum. Plaice (*Pleuronectes platessa*) feeding on live worms, exhibited less complex behaviour sequences than the bothids. All hunting occurred on the substratum and consisted of short sequences of a 'browsing' type of predation. When offered more mobile prey (*Corophium* sp.) plaice did not display the agility nor the complex hunting tactics shown by the bothid species. The simplest feeding behaviour was shown by the sole (*Solea solea*) when feeding on worms and this simplicity is probably related to its olfactory/tactile method of prey location.

FOODS/FEEDING (CONTINUED)

84-000435 Irish, F. J. THE DYNAMICS OF SEED-EATING IN THE CHARACIFORM FISH *COLOSSOMA*. *Am. Zool.* 23(4):1027. 1983. Abstract only. SFA 29(1)

[Harvard Univ., Cambridge, MA] Laboratory studies of variation in the feeding mechanism of the omnivorous teleost *Colossoma* reveal that discrete, consistently different kinematic and electromyographic patterns are elicited by different types of prey. Large seeds (shelled whole almonds) are anchored against the premaxillary teeth while a shearing force is applied by the mandibular teeth. Small pieces are thus sequentially broken off and sucked back into the orobranchial chamber while the body of the seed is passively held between the fleshy lips. Adductor muscle activity during the power stroke is an extended rapid train of pulses. In contrast, adductor activity during processing of soft prey (earthworms and thawed smelt) is rarely pulsed and is of significantly shorter duration. Pulsed adductor activity presumably applies cyclic loading to hard prey and may cause fatigue damage at lower loads than would be required for a single force application. Presence of such a mechanism in other durophagous animals (e.g. crabs and sunfish) suggests it may be a widespread method of dealing with hard food items.

84-000436 Jacob, S. S.; N. B. Nair and N. K. Balasubramanian. INFLUENCE OF CERTAIN ENVIRONMENTAL FACTORS ON THE PREDATORY EFFICIENCY OF THE LARVIVOROUS FISH *MACROPODUS CUPANUS*. *Environ. Biol. Fishes* 9(3-4):295-300. 1 Dec. 1983. SFA 29(1)

[Dep. Aquatic Biol. Fish., Univ. Kerala, Trivandrum 695007, India] Investigations of the effect of certain environmental factors on predatory efficiency of the indigenous larvivorous fish *Macropodus cupanus* indicates the dependence, in a quantifiable way, of predation on the environmental complex surrounding the prey-predator system. Prey consumption is less at low temperatures and increases significantly with rise in temperature. Feeding under conditions of light is significantly higher than in darkness. Salinities of up to 21.83‰ do not affect predation rate, except that owing to stress conditions, prey intake at 21.83‰ is lower than at 0.12‰. Considering fish size, in terms of unit body weight, predation declines significantly as size increases. However, when total body weight is considered, predation increases with increase in fish size. Environmental factors do not alter the time course of predation regularly or significantly, perhaps owing to haphazard intake subsequent to satiation and/or a 'learning' factor. The higher predation rate of this fish when compared to the conventional larvivore *Gambusia affinis* indicates its potential as a biocontrol agent of mosquito larvae.

84-000437 Jobling, M. and A. Wandsvik. AN INVESTIGATION OF FACTORS CONTROLLING FOOD INTAKE IN ARCTIC CHARR, *SALVELINUS ALPINUS* L. *J. Fish Biol.* 23(4):397-404. Oct. 1983. SFA 29(1)

[Inst. Fiskerifag, Univ. Tromsø, 9001 Tromsø, Norway] Digestibility values were determined for diets of varying protein content fed to Arctic charr. The use of these values, in conjunction with food intake data made possible the study of the effects of various parameters on the control of food consumption. Dietary energy content may be more important than protein content in regulating consumption. The regulation of food intake may be partially mediated through factors influencing gastric emptying coupled with mechanisms monitoring dietary metabolizable energy.

84-000438 Kelso, W. E. and J. J. Ney. THE ROLE OF DIFFERENTIAL VISIBILITY IN SIZE-SELECTIVE ZOOPLANKTIVORY BY BLUEGILL SUNFISH. *Va. J. Sci.* 34(3):127. 1983. Abstract only. SFA 29(1)

[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Size-selectivity by zooplanktivorous fish has frequently been reported and may exert a controlling influence on the composition of lentic zooplankton communities.

FOODS/FEEDING (CONTINUED)

84-000438 CONTINUED Laboratory studies have shown that size-selection may be attributed to differential visibility of zooplankton to their predators, but this explanation has not been subjected to field verification. We collected juvenile specimens of the bluegill, a facultative planktivore, and zooplankton concurrently from Claytor Lake, Virginia, and compared length frequency distribution of zooplankton in gut contents and water column samples. Bluegills demonstrated size selection. Application of a differential visibility foraging model to the water column zooplankton size distribution failed to account for the observed prey selection. Other factors (zooplankton behavior and diversity, habitat complexity) appear to override visual discrimination in the selection of zooplankton by lentic bluegill.

84-000439 Kleypas, J. and J. M. Dean. MIGRATION AND FEEDING OF THE PREDATORY FISH, *BAIRDIELLA CHRYSURA* LACÉPÈDE, IN AN INTERTIDAL CREEK. *J. Exp. Mar. Biol. Ecol.* 72(3):199-209. 31 Oct. 1983. SFA 29(1)
[Belle W. Baruch Inst. Mar. Biol. Coastal Res., Univ. S.C., Columbia 29208]

84-000440 Klumpp, D. W. and P. D. Nichols. A STUDY OF FOOD CHAINS IN SEAGRASS COMMUNITIES. II. FOOD OF THE ROCK FLATHEAD, *PLATYCEPHALUS LAEVIGATUS* CUVIER, A MAJOR PREDATOR IN A *POSIDONIA AUSTRALIS* SEAGRASS BED. *Aust. J. Mar. Freshwater Res.* 34(5):745-754. 1983. SFA 29(1)
[Biol. Aust. Helgoland, Notkestr. 31, D 2000 Hamburg 52, West Germany]
Feeding habits of *P. laevigatus* were investigated between February 1980 and November 1981 as part of a larger study on the structure of food chains supporting commercial fishes in the seagrass beds of Corner Inlet, south-eastern Australia. The main food components were crabs, predominantly *Nectocarcinus integrifrons*, and juvenile fishes. Most dietary items were inhabitants of the seagrass zone. Small (25-33 cm) rock flathead showed a preference for fish, squid and shrimp whereas larger (>33 cm) individuals consumed mainly *N. integrifrons* together with some fish. Seasonal variations in diet and feeding intensity occurred. A decrease in feeding intensity in winter was accompanied by a shift in diet from *N. integrifrons* to fish and squid. A second decline in feeding intensity corresponded to the apparent spawning period. The rock flathead and its main prey, *N. integrifrons*, both showed a rhythm in locomotory activity correlated with nocturnal or crepuscular high tides whereas small fish prey were mostly active during daylight.

84-000441 Kokeš, J. POTRAVA JUVENILNÍCH JEDINCŮ PSTRUHA POTOČNÍHO (*SALMO TRUTTA*) DVOU POTOKŮ V POVODÍ ŘÍČKY BĚLÉ. [FOOD OF JUVENILE BROWN TROUT (*SALMO TRUTTA*) IN TWO STREAMS OF BĚLÁ RIVER DRAINAGE AREA.] *Vertebra. Zprávy* 1982:43-47. In Czech with English summ. SFA 29(1)

84-000442 Konchina, Y. V. THE FEEDING NICHE OF THE HAKE, *MERLUCCIIUS GAYI* (MERLUCCIIDAE), AND THE JACK MACKEREL, *TRACHURUS SYMMETRICUS* (CARANGIDAE), IN THE TROPHIC SYSTEM OF THE PERUVIAN COASTAL UPWELLING. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):87-98. 1983. SFA 29(1)
[VNIRO, Moscow, USSR]

FOODS/FEEDING (CONTINUED)

84-000443 Langton, R. W. and R. E. Bowman. FOOD OF EIGHT NORTHWEST ATLANTIC PLEURONECTIFORM FISHES. NOAA Tech. Rep. NMFS SSRF 749. iii + 16p. Sept. 1981. SFA 29(1)

[Dep. Mar. Resour., West Boothbay Harbor, ME 04575] The food of eight species of pleuronectid fishes, occurring in the northwest Atlantic, from Cape Hatteras, N.C., to Nova Scotia have been investigated for the years 1969-72. Gulf Stream flounder, *Citharichthys arctifrons*, are annelid and arthropod predators. Summer and fourspot flounders, *Paralichthys dentatus* and *P. oblongus* prey on fish, squid, and arthropods. The diet of the the windowpane, *Scophthalmus aquosus*, consists of arthropods with mysids, pandalid shrimp, and sand shrimp being especially important prey. Witch flounder, *Glyptocephalus cynoglossus*, are predators of benthic invertebrates, preying heavily on annelids. The primary prey of American plaice, *Hippoglossoides platessoides*, is echinoderms. Yellowtail flounder, *Limanda ferruginea*, are annelid and amphipod predators. Winter flounder, *Pseudopleuronectes americanus*, prey on annelids, coelenterates, and bivalve molluscs.

84-000444 Lewis, S. M. THE EFFECTS OF HERBIVOROUS FISHES IN CARIBBEAN CORAL REEF COMMUNITIES. Am. Zool. 23(4):987. 1983. Abstract only. SFA 29(1)

[Duke Univ., Durham, NC]

84-000445 Lyle, J. M. FOOD AND FEEDING HABITS OF THE LESSER SPOTTED DOGFISH, *SCYLIORHINUS CANICULA* (L.), IN ISLE OF MAN WATERS. J. Fish Biol. 23(6):725-737. Dec. 1983. SFA 29(1)

[Fish Div., Dep. Primary Prod., P.O. Box 4160, Darwin, North Territory, 5794 Australia] Stomach contents of the lesser spotted dogfish, *Scyliorhinus canicula*, from Isle of Man waters were investigated. Dogfish fed opportunistically on a wide range of macrobenthic fauna with hermit crabs, cockles and whelks the dominant prey. Items of secondary importance included various crabs, callianassid shrimps, bivalve molluscs, holothurians, polychaetes and when locally abundant, herring, *Clupea harengus*. Dogfish preyed more heavily on molluscs than reported in previous studies, reflecting the abundance of molluscs in the associated benthic community. Composition of the diet altered gradually with dogfish size, reliance on small crustaceans declined and consumption of hermit crabs and molluscs increased with growth. Seasonal changes in the composition of the diet were observed. Feeding intensity was greatest during summer, related in part to increased prey availability, and was least during autumn.

84-000446 Mace, P. M. PREDATOR-PREY FUNCTIONAL RESPONSES AND PREDATION BY STAGHORN SCULPINS (*LEPTOCOTTUS ARMATUS*) ON CHUM SALMON FRY (*ONCORHYNCHUS KETA*). Ph.D. dissertation, Univ. British Columbia 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2058. Jan. 1984. SFA 29(1)

84-000447 Matlock, G. C. and M. A. Garcia. STOMACH CONTENTS OF SELECTED FISHES FROM TEXAS BAYS. Contrib. Mar. Sci. 26:95-110. Sept. 1983. SFA 29(1)

[Coastal Fish. Br., Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744] The stomachs of 1245 fish representing 17 species were examined during November 1975-July 1976. The fish, 64.7% of which were collected with an 18.3-m bag seine, ranged in size from 14 to 305 mm standard length. The number of fish collected per bay system ranged from 91 in the Galveston Bay system to 216 in the San Antonio Bay system. The number of species collected

FOODS/FEEDING (CONTINUED)

84-000447 CONTINUED per bay system ranged from 11 in the San Antonio Bay system to 15 in the lower Laguna Madre system. The number of stomachs analyzed per species ranged from 5 *Brevortia patronus* to 199 *Micropogonias undulatus*. The stomachs of *B. patronus* and *Mugil cephalus* contained plants only. Stomachs of the remaining species except *Paralichthys lethostigma* contained arthropods and miscellaneous items primarily. Fish were found in 60% of the *P. lethostigma* stomachs. Small and juvenile estuarine fish provide the link through which plants, micro-crustaceans and fish are transported to large predators. Although these were the primary items consumed, small fish also consume protozoans, rotifers, cnidarians, nemerteans, annelids and mollusks, which indicates their ability to consume and utilize many types of food.

84-000448 McKaye, K. R. and A. Marsh. FOOD SWITCHING BY TWO SPECIALIZED ALGAE-SCRAPING CICHLID FISHES IN LAKE MALAWI, AFRICA. *Oecologia (Berl.)* 56(2-3):245-248. Feb. 1983. SFA 29(1)
[Duke Univ. Mar. Lab., Pivers Island, Beaufort, NC 28516]

84-000449 Miller, G. L. TROPHIC RESOURCE ALLOCATION BETWEEN *PERCINA SCIERA* AND *P. OUACHITAE* IN THE TOMBIGBEE RIVER, MISSISSIPPI. *Am. Midl. Nat.* 110(2):299-313. Oct. 1983. SFA 29(1)

[Dep. Entomol., Miss. Entomol. Mus., Drawer EM, Mississippi State 39762]
Aspects of the trophic ecology of *Percina sciera* and *P. ouachitae* from a site on the Tombigbee River, Mississippi, were compared to: (1) determine the extent of seasonal, sexual and size class trophic allocation in the two species; (2) describe the feeding habits of the two species and compare these habits to a syntopic group of benthic fishes, and (3) determine whether a relationship exists between predator morphology and prey characteristics. The two species had similar diets which corresponded closely to diets for darters of similar habitats. There were small qualitative differences in diet, and gut content changed seasonally in both species. *Percina sciera* took larger prey than *P. ouachitae* in the autumn, and this was related to differences in fish size (standard length). Males and females differed in prey size selectivity and the differences were greatest in the spring. With the exception of standard length, no morphological trait of the two species was highly correlated with prey size. Trophic competition is likely of minor importance between these species.

84-000450 Morgan, W. L. and D. A. Ritz. SENSORY CUES AND MECHANISMS INVOLVED IN THE CAPTURE OF EUPHAUSIIDS BY THE AUSTRALIAN SALMON, *ARRIPIS TRUTTA* (BLOCH & SCHNEIDER). *J. Fish Biol.* 23(4):489-493. Oct. 1983. SFA 29(1)

[Dep. Zool., Univ. Tasmania, Box 252C, G.P.O., Hobart, Tasmania, Australia 7001]

84-000451 Motta, P. J. RESPONSE BY POTENTIAL PREY TO CORAL REEF FISH PREDATORS. *Anim. Behav.* 31(4):1257. Nov. 1983. SFA 29(1)

[Dep. Zool., Univ. Mont., Missoula 59812]

84-000452 Nilsen, W. H. and L. A. Helfrich. FOOD HABITS OF BROOK TROUT (*SALVELINUS FONTINALIS*) AND RAINBOW TROUT (*SALMO GAIARDNERI*) IN ALLOPATRIC AND SYMPATRIC POPULATIONS. *Va. J. Sci.* 34(3):132. 1983. Abstract only. SFA 29(1)

[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Food habits of brook and rainbow trout in sympatric and allopatric populations were

FOODS/FEEDING (CONTINUED)

84-000452 CONTINUED investigated to assess the extent to which trout species segregated into dietary niches. Collections of invertebrate drift, benthic invertebrates, and stomach contents of trout (110-210 mm) were made quarterly from August 1981 to June 1982 in three 200 m sections at Little Stony Creek, Giles County, Va. A total of 283 trout stomachs were examined. Stomach content analysis revealed that both species of trout were feeding more consistently on drifting than benthic invertebrates. Diet breadth of sympatric brook trout was generally narrower and exhibited greater seasonal variation than sympatric rainbow or allopatric brook and rainbow trout populations. Diet breadth of sympatric brook trout was narrowest when invertebrate resources were most abundant. Overlap values indicated that brook and rainbow trout utilized similar food resources. The lowest diet overlap values occurred when the density of benthic invertebrates was maximum and density of drifting invertebrates was high. These results suggest that diet segregation increases as food resources increase.

84-000453 Pitcher, T. J. and A. E. Magurran. SHOAL SIZE, PATCH PROFITABILITY AND INFORMATION EXCHANGE IN FORAGING GOLDFISH. *Anim. Behav.* 31(2):546-555. 1983. SFA 29(1)

[Sch. Anim. Biol., Univ. Coll. North Wales, Bangor, Gwynedd LL57 2UW, Wales]

84-000454 Plummer, K. M.; E. E. Demartini and D. A. Roberts. THE FEEDING HABITS AND DISTRIBUTION OF JUVENILE-SMALL ADULT CALIFORNIA HALIBUT (*PARALICHTHYS CALIFORNICUS*) IN COASTAL WATERS OFF NORTHERN SAN DIEGO COUNTY. *Calif. Coop. Oceanic Fish. Invest.* 24:194-201. Oct. 1983. In English with Spanish summ. SFA 29(1)

[Scripps Inst. Oceanogr., Univ. Calif., San Diego 92093] The stomach contents of 336 California halibut 109-689 mm standard length (SL) were examined. Halibut were trawled from 6-m, 18-m, and 30-m depths off San Onofre and near Oceanside from March 1981 to March 1982. The relative influences on diet of depth of capture, predator body size, and the seasonal abundances of major prey types were examined. Major prey by frequency of occurrence were northern anchovy (*Engraulis mordax*) and large mysids, notably *Neomysis kadiakensis*. Northern anchovy dominated by weight; mysids dominated in terms of numbers consumed. Halibut <25 cm SL ate mostly mysids and some larval fishes; halibut >30 cm SL ate mostly northern anchovy and other juvenile and adult fishes. Fish of intermediate (25-30 cm SL) size consumed both prey types in roughly equal frequency. Prevalence of anchovy in the diet tracked the seasonal (summertime) increase of anchovy in nearshore waters. Extent of feeding on mysids reflected mysid abundance much less perfectly. Depth of capture influenced diet little, except indirectly, since relatively small halibut tended to predominate at the shallowest depth sampled. Otter trawl, bag seine, and ichthyoplankton data suggest that the California halibut spawns in nearshore coastal waters, utilizes embayments as nursery grounds while a young juvenile (age-group 0 and yearling), and inhabits shallow, open coastal waters during late juvenile and later life-history stages.

84-000455 Raisanen, G. A. and R. L. Applegate. SELECTION OF LIVE FOOD BY CAPTIVE YELLOW PERCH LARVAE. *Prog. Fish-Cult.* 45(3):172-174. July 1983. SFA 29(1)

[Mammoth Creek Fish Hatchery, Hatch, UT 84735]

FOODS/FEEDING (CONTINUED)

84-000456 Rajasilta, M. and I. Vuorinen. A FIELD STUDY OF PREY SELECTION. IN PLANKTIVOROUS FISH LARVAE. *Oecologia (Berl.)* 59(1):65-68. Aug. 1983. SFA 29(1)

[Lab. Morphol. Ecol., Dep. Biol., Univ. Turku, SF-20500 Turku 50, Finland] The food selection of larval fish was studied from field samples collected in two areas that differ in productivity. In the area where planktonic primary and secondary production was high the fish larvae showed a tendency to specialise and they selected the largest prey species available as food; in the area of lower production fish were generalists and they fed equally on all size classes. Abundance of prey was found to be one of the decisive factors in the prey selection of planktivorous fish larvae. Large prey species (calanoids) were selected when their absolute abundance was high but when their abundance was low, small-sized cladocerans were preferred. Visibility and stage of life history were also assumed to affect the mode of selection.

84-000457 Rauch, G.; T. Mandis and L. E. Harris. PRELIMINARY INVESTIGATION OF FEEDING PREFERENCES OF BROWN TROUT (*SALMO TRUTTA*): MANNER OF FEEDING AND DIET EFFECTS. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:48-53. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Colo. Div. Wildl., Fish Res. Hatchery, Bellevue 80512] Utilization of "wild" salmonids such as the brown trout (*Salmo trutta*) for specific fisheries management goals requires successful propagation of the entire lot without hatchery selection of the more easily domesticated individuals. Hatchery behavior indicated human interferences during feeding could adversely affect growth rates, survival and size uniformity of the final hatchery product. Therefore, hand-fed lots of brown trout were compared to lots fed by automatic feeders with surface feed delivery and automatic feeders with submerged feed delivery systems. The submerged feed delivery was designed to cater to the browns' bottom-feeding tendency. Final growth results showed those lots fed by automatic feeder with submerged feed delivery systems had a significantly greater average total length after 98 days. Little growth benefit could conclusively be attributed to diet preference or automatic feeding with surface delivery, perhaps indicating the reluctance of browns to surface feed even without human interference.

84-000458 Ryer, C. H. and G. W. Boehlert. FEEDING CHRONOLOGY, DAILY RATION, AND THE EFFECTS OF TEMPERATURE UPON GASTRIC EVACUATION IN THE PIPEFISH, *SYNGNATHUS FUSCUS*. *Environ. Biol. Fishes* 9(3-4):301-306. 1 Dec. 1983. SFA 29(1)

[Va. Inst. Mar. Sci., Gloucester Point, VA 23062] Feeding chronology, daily ration, and the effects of temperature upon gastric evacuation were examined in the pipefish, *Syngnathus fuscus*, from field and laboratory data. *S. fuscus* displayed a pattern of diurnal feeding, characteristic of syngnathids. Daily ration calculations yielded estimates of 4.0 and 4.4% body weight per day, which are comparable to estimates for other teleosts. Evacuation rate was found to be temperature dependent, with more rapid evacuation with increasing temperature. In addition, evacuation rate was found to be positively correlated with gut content. Slowing of evacuation rate with decreasing gut content may allow for increased assimilation efficiency during periods of low food availability. Daily ration, although controlled by the temperature dependence of evacuation rate, may also be controlled by prey abundance; fish maximize food intake during periods of high prey availability, and maximize upon assimilation during periods of low prey availability.

FOODS/FEEDING (CONTINUED)

84-000459 Sagar, P. M. and G. A. Eldon. FOOD AND FEEDING OF SMALL FISH IN THE RAKAIA RIVER, NEW ZEALAND. *N.Z. J. Mar. Freshwater Res.* 17(3):213-226. 1983. SFA 29(1)

[Fish. Res. Div., Minist. Agric. Fish., Private Bag, Christchurch, New Zealand]

84-000460 Shvetsov, F. G.; M. L. Starodub and L. L. Sidrevits. THE DAILY FEEDING RHYTHM OF THE BALTIC SPRAT, *SPRATTUS SPRATTUS BALTICUS* (CLUPEIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtirol.)* 23(2):99-105. 1983. SFA 29(1)

[BaltNIIRKh, Riga, USSR]

84-000461 Terazaki, M. and M. Iwata. FEEDING HABITS OF CHUM SALMON FRY *ONCORHYNCHUS KETA* COLLECTED FROM OTSUCHI BAY. *Bull. Jpn. Soc. Sci. Fish.* 49(8):1187-1193. Aug. 1983. SFA 29(1)

[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan] Feeding habits of chum salmon fry was studied, using the samples collected from 7 locations in the Otsuchi Bay during the period from 1978 to 1980. Amphipoda, Appendicularia, Chaetognatha, Cladocera, Copepoda, Euphausiacea, Polychaeta, crab and shrimp larvae, fish eggs and larvae, and land insects were found in stomachs of chum salmon fry. Chum salmon fry generally consumed food organisms that were abundant in their habitats. Epibenthic crustaceans were their important food organisms in the inner part of the bay but zooplankton near the mouth of the bay. The mean feeding rate was 1-4%. Feeding rate of chum salmon fry captured near the mouth was larger than that of fry collected from the inner part of the bay. A remarkable difference was recognized in the feeding rate between day and night. Chum salmon fry did not actively feed during the night. Condition factors of released chum salmon fry was about 0.7 and they increased during their stay in the Otsuchi Bay. Large-sized chum salmon fry living near the mouth of the bay had condition factors of more than 0.9. This suggests that chum salmon fry had good environmental conditions during their stay in the Otsuchi Bay after the seaward migration.

84-000462 Wolf, N. G. FORAGING ECOLOGY OF HERBIVOROUS REEF FISHES IN MIXED-SPECIES GROUPS. *Am. Zool.* 23(4):985. 1983. Abstract only. SFA 29(1)

[Woods Hole Oceanogr. Inst., Woods Hole, MA] Tagged parrotfish and surgeonfish spent more time feeding when in groups than when alone. *Scarus iserti* and *Acanthurus bahianus* ate more *Ceramium nitens*, a selected food, and less blue-green algae with sand, an avoided food, as group size increased. Some species changed diet in response to group composition. *A. bahianus* consumed less *Ceramium* as the proportion of parrotfishes increased. *Sparisoma* ate less *Halimeda*, a food that it selects but the other herbivores avoid, when the proportion of non-congeneric group members increased. Thus, fishes such as *Sparisoma* and *Acanthurus* experience some costs when in mixed groups, but can participate in larger groups with a concomitant increase in time devoted to foraging.

AGE AND GROWTH

84-000463 Nævdal, G.; R. Lerøy and D. Møller. SOURCES OF VARIATION IN WEIGHT AND LENGTH OF ATLANTIC SALMON. *Fiskeridir. Skr. Ser. Havunders.* 17(9):359-366. 1983. SFA 29(1)

AGE AND GROWTH (CONTINUED)

84-000463 CONTINUED

[Inst. Mar. Res., Bergen, Norway] Variances of weight and total length of four year classes of farmed Atlantic salmon after two years in the sea were distributed on strain, family, maturing/immature (after two winters) and sex. Highly significant variations between families were found. Also significant variations due to sex and stage of maturity were evident. On an average males were heavier and longer than females, and maturing fish on an average were heavier and showed higher condition than immature within most groups. Differences in length between maturing and immature fish were not obvious. The higher condition factors of mature than immature fish were not caused by higher gonad weights.

84-000464 Abdu-Nabi, A. H. FACTORS RELATED TO SELECTION OF FISH SCALES FOR GROWTH STUDIES OF YELLOW PERCH, *PERCA FLAVESCENS*. Ph.D. dissertation, Iowa State Univ. 119p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1703. Dec. 1983. SFA 29(1)

Standardization of the body area for scale sampling from growth studies of fish becomes more essential if the a value in the Fraser-Lee equation is to be standardized as suggested by Carlander (1982). In a study on yellow perch (*Perca flavescens*) from West Okoboji Lake and Clear Lake in Iowa, the body area located at the tip of the pectoral fin below the lateral line was found to be the best area for scale sampling. This area exhibited the lowest variability in scale size and the lowest frequency of regenerated scales of the 10 areas sampled. The optimum number of scales to be sampled from the best area was three scales if at least one readable scale is sought. No significant difference in the body-scale relationship was found between sexes nor among the four seasons in which fish were sampled. There was a significant difference in the a value of the regression equation between West Okoboji and Clear Lake samples. The number of scales along the lateral line did not differ significantly among various fish lengths nor between sexes or the two sampled populations. The scale shape (scale radius/diameter ratio) changed in young fish as the fish grew in length until a total length of about 100 mm was reached, beyond which the scale shape remained constant. This feature of change in the scale shape contributes to curvilinearity in the body-scale relationship in young fish. Key scales sampled in two previous studies varied more in scale radius and in body-scale relationship than scales sampled from the best area.

84-000465 Beamish, R. J. and G. A. McFarlane. THE FORGOTTEN REQUIREMENT FOR AGE VALIDATION IN FISHERIES BIOLOGY. *Trans. Am. Fish. Soc.* 112(6):735-743. Nov. 1983. SFA 29(1)

[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-000466 Dwyer, W. P.; R. G. Piper and C. E. Smith. BROOK TROUT GROWTH EFFICIENCY AS AFFECTED BY TEMPERATURE. *Prog. Fish-Cult.* 45(3):161-163. July 1983. SFA 29(1)

[U.S. FWS, Fish Cult. Dev. Cent., 4050 Bridger Canyon Rd., Bozeman, MT 59715]

84-000467 Graham, R. J. THE USE OF OTOLITHS FOR DETERMINING DAILY AGES OF YOUNG-OF-THE-YEAR SMALLMOUTH BASS. *Va. J. Sci.* 34(3):122. 1983. Abstract only. SFA 29(1)

[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Viable smallmouth bass eggs were collected from a wild nest on 26 May, 1982 and hatched under laboratory conditions to determine if the growth rings on the sagittae of young-of-the-year smallmouth bass were daily rings as suggested by previous otolith research. Ten smallmouth bass were removed from the laboratory culture every other day from the time of swim-up until 14 days after swim-up,

AGE AND GROWTH (CONTINUED)

84-000467 CONTINUED frozen, and the saggitae later examined for growth rings. Results indicate that saggital growth rings are laid down on a daily basis with the first daily growth ring laid down within one day of larval swim-up. Techniques for the preparation and reading of smallmouth bass saggitae are discussed. Examination of the saggitae of young-of-the-year smallmouth bass collected from 5 study sites within the New River drainage disclosed simultaneous spawning occurred during 1982, with a minor spawn of short duration occurring in late May and a major spawn of longer duration occurring during the last three weeks of June.

84-000468 Libosvářský, J. and D. W. Saeed. IMPACT OF A NEWLY BUILT RESERVOIR ON GROWTH-RATE OF ROACH. *Folia Zool. (Brno)* 32(2):167-178. 1983. In English with Czech summ. SFA 29(1)

[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

84-000469 Libosvářský, J. EXTREME BODY DEPTHS AND WEIGHTS IN ROACH, RUDD AND SILVER BREAM IN THE MUŠOV RESERVOIR IN 1980. *Folia Zool. (Brno)* 32(2):153-166. 1983. In English with Czech summ. SFA 29(1)

[Inst. Vert. Zool., Czech. Acad. Sci., Brno, Czechoslovakia]

84-000470 MacGregor, J. S. GROWTH OF THE BLUE ROCKFISH (*SEBASTES MYSTINUS*). *Calif. Coop. Oceanic Fish. Invest.* 24:216-225. Oct. 1983. In English with Spanish summ. SFA 29(1)

[NMFS, Southwest Fish. Cent., La Jolla, CA 92038] Weight-length and age-length data were obtained for samples of blue rockfish (*Sebastes mystinus*) taken off southern California. For weight-length, $W = aL^b$, the value of a was found to be 2.043×10^{-5} ; the value of b , 3.059. The Von Bertalanffy curve was used for age length. It was determined that $L_{\infty} = 327.6$ mm, $k = 0.1428$, and $t_0 = -1.553$.

84-000471 Pratt, H. L., Jr. and J. G. Casey. AGE AND GROWTH OF THE SHORTFIN MAKO, *ISURUS OXYRINCHUS*, USING FOUR METHODS. *Can. J. Fish. Aquatic Sci.* 40(11):1944-1957. Nov. 1983. In English with French summ. SFA 29(1)

[NMFS, Narragansett Lab., Narragansett, RI 02882]

84-000472 Redkozubov, Y. N. CHANGES IN GROWTH OF THE BAIKAL OMUL, *COREGONUS AUTUMNALIS MIGRATORIUS* (SALMONIDAE), DURING A TWENTY YEAR PERIOD (1952-1972). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(2):79-86. 1983. SFA 29(1)

[AtlantNIRO, Kaliningrad, USSR] A comparison was carried out on the relative growth of three age groups of the Baikal omul, *Coregonus autumnalis migratorius* which were similar as regards the biological state of young (1+), sexually immature (2+ - 4+) and sexually mature (5+ or older) fish for the period 1952 to 1972. Growth increments for each age group are particularly individual and in a cause and effect relationship with the food supply. A general decrease in the rate of growth was noted in the 1950's and from the middle of the 1960's in connection with a deterioration of the forage base.

84-000473 Rice, J. A.; J. E. Breck; S. M. Bartell and J. F. Kitchell. EVALUATING THE CONSTRAINTS OF TEMPERATURE, ACTIVITY AND CONSUMPTION ON GROWTH OF LARGEMOUTH BASS. *Environ. Biol. Fishes* 9(3-4):263-275. 1 Dec.

AGE AND GROWTH (CONTINUED)

84-000473 CONTINUED 1983. SFA 29(1)

[Lab. Bimnol., Univ. Wis., Madison 53706] We present a bioenergetics model for largemouth bass (*Micropterus salmoides*) which simulates growth as a function of body size, temperature, activity and consumption level. We apply the model to investigate seasonal changes in condition factor exhibited by bass in Par Pond, South Carolina, a reservoir receiving heated effluent. Previous authors have suggested that these changes occur due to bioenergetic constraints, primarily the effects of heated effluent on metabolic rate. Model simulations were used to evaluate the hypotheses that seasonal changes in condition factor were caused by the heated effluent, seasonally variable activity, seasonally variable consumption, or reproductive costs. Results indicate that temperature is not directly responsible for the seasonal changes in condition factor. Bass moderate the influence of the heated effluent via behavioral thermoregulation. Activity is not a major factor, and spawning weight-loss can account for only a small portion of the observed variation. However, the pattern of seasonal changes in body condition may be adequately explained by seasonal variations in consumption. The patterns of consumption rate and/or prey availability suggested by model simulations represent testable hypotheses.

84-000474 Salinas, I. M. and I. A. McLaren. SEASONAL VARIATION IN WEIGHT-SPECIFIC GROWTH RATES, FEEDING RATES, AND GROWTH EFFICIENCIES IN *MICROGADUS TOMCOD*. Can. J. Fish. Aquatic Sci. 40(12):2197-2200. Dec. 1983. In English with French summ. SFA 29(1)

[Biol. Dep., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

84-000475 Sihua, W. [ON THE AGE AND GROWTH OF THE CARP (*CYPRINUS CARPIO* L.) IN HURLEG LAKE OF QINGHAI PROVINCE.] Acta Zool. Sin. 29(1):59-65. 1983. In Chinese with English summ. SFA 29(1)

[Northwest Plateau Inst. Biol., Acad. Sin., China]

84-000476 Villaluz, A. C. and A. Unggui. EFFECTS OF TEMPERATURE ON BEHAVIOR, GROWTH, DEVELOPMENT AND SURVIVAL IN YOUNG MILKFISH, *CHANOS CHANOS* (FORSKAL). Aquaculture 35(4):321-330. Dec. 1983. SFA 29(1)

[Aquacult. Dep., Southeast Asian Fish. Dev. Cent., P.O. Box 256, Iloilo City, Philippines] Effects of three temperature treatments on activity, feeding, growth, development and survival of young milkfish (*Chanos chanos*) were investigated. Low temperature (<22.6°C) and hypoxial condition (<1 ppm O₂) decreased activity, responsiveness and food intake; high temperature (up to 33°C) had the opposite effect. Growth and development were fastest in fish maintained in high temperature ($\bar{x}$ = 29.5°C). Fish in low temperature ($\bar{x}$ = 20.7°C) had the least growth and were inhibited from developing into juveniles during the 3-month period. Highest survival ($\bar{x}$ = 99.7%) was obtained in high temperature but was not significantly different ($P > 0.05$) from ambient temperature ($\bar{x}$ = 97.7%).

84-000477 Walton, C. J. GROWTH PARAMETERS FOR TYPICAL ANADROMOUS AND DWARF STOCKS OF ALEWIVES, *ALOSA PSEUDOHARENGUS* (PISCES, CLUPEIDAE). Environ. Biol. Fishes 9(3-4):277-287. 1 Dec. 1983. SFA 29(1)

[Me. Dep. Mar. Resour., Mar. Res. Lab., West Boothbay Harbor 04575] Growth parameters for anadromous alewives, *Alosa pseudoharengus* (Clupeidae) from two Gulf of Maine watersheds are described. Fish from Damariscotta Lake are typical of other coastal anadromous stocks whereas fish from Walker Pond are dwarfs. The dwarf stock has a life history pattern intermediate between that of fully landlocked and typical anadromous stocks. The dwarfs

AGE AND GROWTH (CONTINUED)

84-000477 CONTINUED are anadromous but their young remain in freshwater approximately 16 months, compared to the 2 to 4 months typical of anadromous stocks. This prolonged period of freshwater residence includes a greatly extended larval period and a reduced growth rate. The data suggest that the principal adaptive interval in alewife life history occurs during early ontogeny and that variations in larval development may be the basis for the evolution of fully landlocked stocks from anadromous ancestors.

84-000478 Wohlgemuth, E. NĚKTERÉ BIOLOGICKÉ PARAMETRY POPULACE OUKLEJE OBECNÉ (*ALBURNUS ALBURNUS*) V BRNĚNSKÉ ÚDOLNÍ NÁDRŽI. [CERTAIN BIOLOGICAL PARAMETERS OF THE BLEAK (*ALBURNUS ALBURNUS*) POPULATION IN THE BRNO RESERVOIR.] *Vertebra. Zprávy* 1982:41-43. 1982. In Czech with English summ. SFA 29(1)

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

84-000479 Ambak, M. A.; A. K. M. Mohsin and M. Y. Fatimah. DIURNAL CYCLE OF SPECIES OCCURRENCE, ABUNDANCE AND DIVERSITY IN PAYA BUNGOR FISH POPULATIONS. *Malay. Appl. Biol.* 12(1):29-36. June 1983. SFA 29(1)
[Fac. Fish. Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, West Malaysia]

84-000480 Balon, E. K. and D. J. Stewart. FISH ASSEMBLAGES IN A RIVER WITH UNUSUAL GRADIENT (LUONGO, AFRICA ZAIRE SYSTEM), REFLECTIONS ON RIVER ZONATION, AND DESCRIPTION OF ANOTHER NEW SPECIES. *Environ. Biol. Fishes* 9(3-4):225-252. 1 Dec. 1983. SFA 29(1)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

84-000481 Bergstedt, R. A. ORIGINS OF RAINBOW SMELT IN LAKE ONTARIO. *J. Great Lakes Res.* 9(4):582-583. 1983. SFA 29(1)
[U.S. FWS, Oswego Biol. Stn., 17 Lake Street, Oswego, NY 13126] The first rainbow smelt (*Osmerus mordax*) to enter Lake Ontario were probably migrants from an anadromous strain introduced into New York's Finger Lakes. Since the upper Great Lakes were originally stocked with a landlocked strain from Green Lake, Maine, subsequent migration to Lake Ontario from Lake Erie makes Lake Ontario unique among the Great Lakes in probably having received introductions from two distinct populations.

84-000482 Cross, F. B.; O. T. Gorman and S. G. Haslouer. THE RED RIVER SHINER, *NOTROPIS BAIRDI*, IN KANSAS WITH NOTES ON DEPLETION OF ITS ARKANSAS RIVER COGNATE, *NOTROPIS GIRARDI*. *Trans. Kans. Acad. Sci.* 86:93-98. 1983. SFA 29(1)
[Mus. Nat. Hist., Univ. Kans., Lawrence 66045]

84-000483 Denoncourt, R. F.; W. F. Skinner; R. B. Domermuth and J. M. Burke. DISTRIBUTION OF FISHES IN THE BRODHEAD CREEK DRAINAGE MONROE COUNTY, PENNSYLVANIA. *Proc. Pa. Acad. Sci.* 57(1):56-60. 1983. SFA 29(1)
[Dep. Biol. Sci., York Coll. Pa., York, PA 17404]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

84-000484 Douglas, M. E. and R. C. Vrijenhoek. ENDANGERED ICHTHYOFAUNA OF THE SOUTHWEST UNITED STATES: AN EXAMPLE USING THE GILA TOPMINNOW, *POECILIOPSIS OCCIDENTALIS*. *Am. Zool.* 23(4):966. 1983. Abstract only. SFA 29(1)

[Okla. State Univ., Stillwater] The fossil history of the southwestern ichthyofauna speaks of isolated lineages that are relictual and extinction-prone. The steady decline of this fauna has been documented. For example, *Poeciliopsis occidentalis* was once widespread in the Gila River drainages of the southwest, but is now restricted to a series of isolated pools in southwest Arizona where it is rapidly declining in abundance. Although currently on the U.S. Endangered Species List, this form is abundant in 4 riverine systems of northwest Mexico. We evaluated the distribution of genetic variability in 7 Arizonan and 16 Mexican populations of this fish using starch-gel electrophoresis. Our results indicate 3 distinct subspecies. Those fish in Arizona are not unique, but instead represent the northern most (ecologically marginal) populations of two widespread Mexican subspecies. The Gila topminnow is endangered in the United States only if we recognize this status solely on the basis of national boundaries.

84-000485 Frost, K. J. and L. F. Lowry. DEMERSAL FISHES AND INVERTEBRATES TRAWLED IN THE NORTHEASTERN CHUKCHI AND WESTERN BEAUFORT SEAS, 1976-77. *NOAA Tech. Rep. NMFS SSRF* iii + 22p. Feb. 1983. SFA 29(1)

[Alaska Dep. Fish Game, 1300 College Rd., Fairbanks 99701]

84-000486 Garzon F., J. and A. Acero P. NOTAS SOBRE LA PESCA Y LOS PECES COMERCIALES DE LA ISLA DE PROVIDENCIA (COLOMBIA), INCLUYENDO NUEVOS REGISTROS PARA EL CARIBE OCCIDENTAL. [NOTES ON THE FISHERIES AND COMMERCIAL FISHES OF THE ISLA DE PROVIDENCIA (COLOMBIA), INCLUDING NEW RECORDS FROM THE WESTERN CARIBBEAN.] *Caribb. J. Sci.* 19(3-4):9-19. Sept. 1983. In Spanish with English summ. SFA 29(1)

[INVEMAR, Apt. Aéreo 1016, Santa Marta, Colombia]

84-000487 Hendricks, M. L.; J. R. Stauffer, Jr. and C. H. Hocutt. THE ZOOGEOGRAPHY OF THE FISHES OF THE YOUGHIOGHENY RIVER SYSTEM, PENNSYLVANIA, MARYLAND AND WEST VIRGINIA. *Am. Midl. Nat.* 110(1):145-164. July 1983. SFA 29(1)

[RMC-Muddy Run Ecol. Lab., P.O. Box 10, Drumore, PA 17518]

84-000488 Ishino, K.; A. Goto and K. Hamada. STUDIES ON THE FRESHWATER FISH IN HOKKAIDO, JAPAN-III. DISTRIBUTION OF THREE TYPES OF A GOBY, *CHAENOGOBIOUS ANNULARIS*. *Bull. Fac. Fish. Hokkaido Univ.* 34(3):192-207. Aug. 1983. In Japanese with English summ. SFA 29(1)

[Lab. Embryol. Genet., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

84-000489 Loeb, V. J.; P. E. Smith and H. G. Moser. GEOGRAPHICAL AND SEASONAL PATTERNS OF LARVAL FISH SPECIES STRUCTURE IN THE CALIFORNIA CURRENT AREA, 1975. *Calif. Coop. Oceanic Fish. Invest.* 24:132-151. Oct. 1983. In English with Spanish summ. SFA 29(1)

[Moss Landing Mar. Lab., P.O. Box 223, Moss Landing, CA 95039]

84-000490 Mayden, R. L. and F. B. Cross. REEVALUATION OF OKLAHOMA RECORDS OF THE SOUTHERN CAVEFISH, *TYPHLICHTHYS SUBTERRANEUS* GIRARD (AMBLYOPOSIDAE). *Southwest Nat.* 28(4):471-473. 9 Dec. 1983. SFA 29(1)

[Div. Fish., Mus. Nat. Hist., Univ. Kans., Lawrence 66045]

SPORT FISHERY ABSTRACTS

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

84-000491 Miller, D. L. RARE FISHES OF THE ARKANSAS RIVER DRAINAGE IN COLORADO. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:6-11. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

84-000492 Rieber, R. W. REPRODUCTION OF ARCTIC GRAYLING, *THYMALLUS ARCTICUS*, IN THE LOBDELL LAKE SYSTEM, CALIFORNIA. *Calif. Fish Game* 69(3):191-192. July 1983. SFA 29(1)

[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616]

84-000493 Sheridan, P. F. ABUNDANCE AND DISTRIBUTION OF FISHES IN THE GALVESTON BAY SYSTEM, 1963-1964. *Contrib. Mar. Sci.* 26:143-163. Sept. 1983. SFA 29(1)

[U.S. Dep. Commerce, Natl. Mar. Fish. Serv., 4700 Ave. U, Galveston, TX 77550]

84-000494 Smith, V. G. F. FISH FROM FAST FLOWING RIVERS AND STREAMS ON THE JOS PLATEAU. *Nigerian Field* 47(4):201-211. Aug. 1983. SFA 29(1)

[Sch. Sci., Nene Coll., Northampton, England]

84-000495 Tortonese, E. LIST OF FISHES OBSERVED NEAR JEDDAH (SAUDI ARABIA). *J. Fac. Mar. Sci. (Jeddah)* 3:105-110. 1983. In English with Arabic summ. SFA 29(1)

[Ist. Zooprof., Lungo Bisagno Dalmazia 45 A 16141 Genova, Italy]

84-000496 Tremblay, C.; B. Portelance and J. Fréchette. BOTTOM TRAWL INVENTORY OF FISH AND CRUSTACEANS FROM THE MARINE ESTUARY OF THE ST. LAWRENCE. *Que. Dir. Rech. Sci. Tech. Cah. Inf. No.* 103. 96p. 1983. In French with English summ. SFA 29(1)

[Dir. Gen. Pêches Mar., Dir. Rech. Sci. Tech., 2700, Einstein, Ste-Foy, PQ G1P 3W8, Canada]

84-000497 Yinrui, C.; L. Zaiyun and C. Yiyu. [THE ORIGIN OF FISH FAUNA AND ITS SPECIATION IN CHEN HAI LAKE, YUNNAN, CHINA.] *Zool. Res.* 4(3):227-234. Aug. 1983. SFA 29(1)

[Kumming Inst. Zool., Acad. Sin., China]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

84-000498 Barber, R. T. and F. P. Chavez. BIOLOGICAL CONSEQUENCES OF EL NIÑO. *Science* 222(4629):1203-1210. 16 Dec. 1983. SFA 29(1)

[Dep. Zool., Duke Univ., Beaufort, NC 28516] Observations of the 1982-1983 El Niño make it possible to relate the anomalous ocean conditions to specific biological responses. In October 1982 upwelling ecosystems in the eastern equatorial Pacific began a series of transitions from the normal highly productive condition to greatly reduced productivity. The highly productive condition had returned by July 1983. Nutrients, phytoplankton biomass, and primary productivity are clearly regulated by the physical changes of El Niño. Evidence from 1982 and 1983 also suggests effects on higher organisms such as fish, seabirds, and marine mammals, but several

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

84-000498 CONTINUED more years of observation are required to accurately determine the magnitude of the consequences on these higher trophic levels.

84-000499 Donnelly, R. F. FACTORS AFFECTING THE ABUNDANCE OF KODIAK ARCHIPELAGO PINK SALMON (*ONCORHYNCHUS GORBUSCHA*, WALBAUM). Ph.D. dissertation, Univ. Wash. 170p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1332. Nov. 1983. SFA 29(1)

Fluctuations in abundance of Kodiak Archipelago pink salmon are under control of many facets of their environment, including a density-dependent interaction between but not within broodlines. Models for predicting future abundance fluctuations were developed and analyzed.--From abstr.

84-000500 Dyer, M. F.; J. G. Pope; P. D. Fry; R. J. Law and J. E. Portmann. CHANGES IN FISH AND BENTHOS CATCHES OFF THE DANISH COAST IN SEPTEMBER 1981. *J. Mar. Biol. Assoc. U.K.* 63(4):767-775. Nov. 1983. SFA 29(1)

[Anglian Water, Great Ouse House, Clarendon Road, Cambridge CB2 2BL, England] During a routine North Sea demersal fish survey, very low fish catches were recorded at two primary stations off the Danish coast in September 1981. The catch of benthos at these stations was much greater than the previous year, and underwater photographs from a headline camera revealed that this was a result of most infaunal species having emerged from beneath the sand. The phenomenon was assumed to be caused by low oxygen concentrations in bottom water following the collapse of a bloom of the dinoflagellate *Ceratium furca*.

84-000501 Englert, J. and B. H. Seghers. PREDATION BY FISH AND COMMON MERGANSERS ON DARTERS (PISCES: PERCIDAE) IN THE THAMES RIVER WATERSHED OF SOUTHWESTERN ONTARIO. *Can. Field-Nat.* 97(2):218-219. Apr.-June 1983. SFA 29(1)

[B.H. Seghers: Kananaskis Cent. Environ. Res., Univ. Calgary, Seebe, Alberta T0L 1X0, Canada] A survey of potential predators of darters in the Thames River watershed near London, Ontario revealed that darters were rarely consumed by other fish species; however, they did appear to be an important food resource for Common Mergansers (*Mergus merganser*) during their spring migration.

84-000502 Loeb, V. J.; P. E. Smith and H. G. Moser. RECURRENT GROUPS OF LARVAL FISH SPECIES IN THE CALIFORNIA CURRENT AREA. *Calif. Coop. Oceanic Fish. Invest.* 24:152-164. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Moss Landing Mar. Lab., P.O. Box 223, Moss Landing, CA 95039]

84-000503 McLain, D. R. and D. H. Thomas. YEAR-TO-YEAR FLUCTUATIONS OF THE CALIFORNIA COUNTERCURRENT AND EFFECTS ON MARINE ORGANISMS. *Calif. Coop. Oceanic Fish. Invest.* 24:165-181. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, P.O. Box 831, Monterey, CA 93942]

84-000504 Ross, S. T. and J. A. Baker. THE RESPONSE OF FISHES TO PERIODIC SPRING FLOODS IN A SOUTHEASTERN STREAM. *Am. Midl. Nat.* 109(1):1-14. Jan. 1983. SFA 29(1)

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

84-000504 CONTINUED

[Dep. Biol., Box 5018, Univ. South Miss., Hattiesburg 39401] Movement of fishes onto a fringing floodplain was studied by seining and trapping during five spring floods. We collected 26 species from the inundated floodplain; the known channel fauna is 42 species. Species numerically dominant on and floodplain were *Fundulus olivaceus*, *F. nolti*, *Gambusia affinis*, *Notropis welaka*, *N. texanus*, *N. roseipinnis*, *Lepomis macrochirus*, *L. cyanellus* and *L. marginatus*. Catch-per-effort in traps was generally greatest on the upper floodplain during the day and greatest nearer the channel at night. Night activity of fishes on the floodplain was apparently low. Several species, which we term flood-quiescent forms, were common in the channel (e.g., *Lepomis megalotis* and *Percina nigrofasciata*) but did not exploit the floodplain. Activity (as catch per trap-hour) of *P. nigrofasciata* was negatively correlated with flood-induced turbidity. A flood-exploitative species, *Notropis texanus*, had higher population abundance during 3 high-flow years than in 3 low-flow years, suggesting that spring flooding may exert significant control over fish community structure.

84-000505 Shulman, M. J. RESOURCE LIMITATION AND RECRUITMENT PATTERNS IN A CORAL REEF FISH ASSEMBLAGE. *J. Exp. Mar. Biol. Ecol.* 74(1):85-109. 5 Jan. 1984. SFA 29(1)

[Smithsonian Trop. Res. Inst., APO Miami 34002, FL]

84-000506 Stearns, S. C. A NATURAL EXPERIMENT IN LIFE-HISTORY EVOLUTION: FIELD DATA ON THE INTRODUCTION OF MOSQUITOFISH (*GAMBUSIA AFFINIS*) TO HAWAII. *Evolution* 37(3):601-617. May 1983. SFA 29(1)

[Biol. Lab., Reed Coll., Portland, OR 97202]

84-000507 Stearns, S. C. THE GENETIC BASIS OF DIFFERENCES IN LIFE-HISTORY TRAITS AMONG SIX POPULATIONS OF MOSQUITOFISH (*GAMBUSIA AFFINIS*) THAT SHARED ANCESTORS IN 1905. *Evolution* 37(3):618-627. May 1983. SFA 29(1)

[Biol. Lab., Reed Coll., Portland, OR 97202]

84-000508 Stevens, D. E. and L. W. Miller. EFFECTS OF RIVER FLOW ON ABUNDANCE OF YOUNG CHINOOK SALMON, AMERICAN SHAD, LONGFIN SMELT, AND DELTA SMELT IN THE SACRAMENTO-SAN JOAQUIN RIVER SYSTEM. *N. Am. J. Fish. Manage.* 3(4):425-437. 1983. SFA 29(1)

[Calif. Dep. Fish Game, Bay-Delta Fish. Proj., 4001 North Wilson Way, Stockton 95205]

84-000509 Vaughan, D. S.; R. M. Yoshiyama; J. E. Breck and D. L. DeAngelis. REVIEW AND ANALYSIS OF EXISTING MODELING APPROACHES FOR ASSESSING POPULATION-LEVEL EFFECTS OF MULTIPLE STRESSES ON FISH AND SHELLFISH. *Oak Ridge Natl. Lab. Environ. Sci. Div. Publ. No.* 1979. 164p. Nov. 1982. From U.S. Government Reports 83(14):3078. 8 July 1983. Available from NTIS as DE83004175. SFA 29(1)

84-000510 Wooster, W. S., (ed.) INTERANNUAL VARIABILITY OF THE ENVIRONMENT AND FISHERIES OF THE GULF OF ALASKA AND THE EASTERN BERING SEA. *Wash. Sea Grant Prog.* WSG-WO 83-3. vi + 208p. Oct. 1983. A collection of papers.--RS SFA 29(1)

[Wash. Sea Grant Prog., Coll. Ocean Fish. Sci., Univ. Wash., Seattle 98195]

IDENTIFICATION, KEYS, CLASSIFICATION

- 84-000511 Barsukov, V. V. and L. A. Borets. NEW DATA ON THE KINMEI ROSEFISH, *HELICOLENUS FEDOROWI* (SEBASTINAE, SCORPAENIDAE). *J. Ichthyol.* (Engl. Transl. *Vopr. Ikhtiol.*) 23(2):1-8. 1983. SFA 29(1)
[Zool. Inst., Acad. Sci. USSR, Leningrad, USSR]
- 84-000512 Chunyuan, W. and L. Yanling. TAXONOMY AND PHYLOGENY OF DIFFERENT VARIETIES OF THE GOLDFISH (*CARASSIUS AURATUS*) IN CHINA. *Acta Zool. Sin.* 29(3):267-277. 1983. In Chinese with English summ. SFA 29(1)
[Inst. Genet., Acad. Sin., Beijing, China]
- 84-000513 Collette, B. B. TWO NEW SPECIES OF CORAL TOADFISHES, FAMILY BATRACHOIDIDAE, GENUS *SANOPUS*, FROM YUCATAN, MEXICO, AND BELIZE. *Proc. Biol. Soc. Wash.* 96(4):719-724. 29 Dec. 1983. SFA 29(1)
[NMFS Syst. Lab., Natl. Mus. Nat. Hist., Washington, DC 20560]
- 84-000514 Collette, B. B. RECOGNITION OF TWO SPECIES OF DOUBLE-LINED MACKERELS (*GRAMMATORCYNUS*: SCOMBRIDAE). *Proc. Biol. Soc. Wash.* 96(4):715-718. 29 Dec. 1983. SFA 29(1)
[Natl. Mar. Fish. Serv. Syst. Lab., Natl. Mus. Nat. Hist., Washington, DC 20560]
- 84-000515 Compagno, L. J. V. and J. A. F. Garrick. *NASOLAMIA*, NEW GENUS, FOR THE SHARK *CARCHARHINUS VELOX* GILBERT, 1898 (ELASMOBRANCHII: CARCHARHINIDAE). *Victoria Univ. Wellington Zool. Publ.* No. 76. 16p. Aug. 1983. SFA 29(1)
[Victoria Univ., Wellington, New Zealand]
- 84-000516 Crabtree, R. E. CONFIRMATION OF THE VALIDITY OF *CORYPHAENOIDES ALATERALIS* AS DISTINCT FROM *CORYPHAENOIDES THELESTOMUS* BASED ON NEW CAPTURES FROM THE NORTH ATLANTIC. *Copeia* 1983(4):1083-1086. 14 Dec. 1983. SFA 29(1)
[Va. Inst. Mar. Sci., Gloucester Point, VA 23062]
- 84-000517 Dunn, J. R. THE UTILITY OF DEVELOPMENTAL OSTEOLOGY IN TAXONOMIC AND SYSTEMATIC STUDIES OF TELEOST LARVAE: A REVIEW. *NOAA Tech. Rep. NMFS Circ.* 450. iii + 19p. June 1983. SFA 29(1)
[NMFS, 2725 Montlake Blvd. East., Seattle, WA 98112] Numerous examples from the literature indicate that cartilaginous and bony structures aid in the taxonomy of teleost larvae. The vertebral column, neural and haemal spines, ribs, predorsal bones, basal supports, and constituent bones of the median and paired fins, and the bones of the skull have all been used to varying degrees in larval fish taxonomy. The size, number, and morphology of cartilaginous or bony structures and their sequence of ossification have been employed to elucidate identification of larvae. Such structures have been used as characters at every taxonomic level, although no single structure has been found to be useful at all levels. Various methods for preparing and studying cartilaginous or bony structures are available (e.g., clearing and staining, and radiography). The use of biological stains for detecting cartilage and/or bone, however, is the technique most commonly used for larval fishes. Studies of developmental osteology have been used only recently to infer phylogenetic relationships of teleosts. Morphological

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-000517 CONTINUED characters and their development have great systematic utility at all hierarchical levels. Osteological studies of fish larvae and rigorous documentation and analyses of such studies in the primary literature have the potential to notably increase our understanding of teleost phylogeny.

84-000518 Echelle, A. A.; A. F. Echelle and C. D. Crozier. EVOLUTION OF AN ALL-FEMALE FISH, *MENIDIA CLARKHUBBSI* (ATHERINIDAE). *Evolution* 37(4):772-784. July 1983. SFA 29(1)
[Zool. Dep., Okla. State Univ., Stillwater 74078]

84-000519 Findley, L. T. A REVISION OF THE EASTERN PACIFIC SPECIES OF THE GOBIID FISH GENUS *CHRIOLEPIS* (TELEOSTEI: GOBIOIDEI). *Ph.D. dissertation, Univ. Ariz.* 212p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1744. Dec. 1983. SFA 29(1)

84-000520 Grudzien, T. A. and B. J. Turner. BIOCHEMICAL SYSTEMATICS OF *ALLODONTICHTHYS*: A GENUS OF GOODEID FISHES. *Biochem. Syst. Ecol.* 11(4):383-388. 1983. SFA 29(1)

[Dep. Biol., VPI & SU, Blacksburg, VA 24061] *Allodontichthys* Hubbs and Turner 1939 of the family Goodeidae is comprised of three species: *A. tamazulae* and *A. hubbsi* from the Rio Coahuayana and *A. zonistius* from the Rio Armeria in Estados Jalisco and Colima, Mexico. These fish are found throughout the shallow riffles of small streams. Their systematics has been based on morphological and karyological traits. An alloenzymic study of the genus produced results which agree well with the previous morphological studies. Moreover, a dendrogram of Nei genetic identities agrees well with the zoogeography of the species. The data indicate a high degree of congruence between alloenzymic and morphological systematic inferences in this group of fishes.

84-000521 Hardy, G. S. A NEW GENUS AND TWO NEW SPECIES OF CLINGFISHES (GOBIESOCIDAE) FROM NEW ZEALAND. *Copeia* 1983(4):863-868. 14 Dec. 1983. SFA 29(1)
[Natl. Mus. N. Z., Private Bay, Wellington, New Zealand]

84-000522 Heemstra, P. C. and W. D. Anderson, Jr. A NEW SPECIES OF THE SERRANID FISH GENUS *PLECTRANTHIAS* (PISCES: PERCIFORMES) FROM THE SOUTHEASTERN PACIFIC OCEAN, WITH COMMENTS ON THE GENUS *ELLERKELDIA*. *Proc. Biol. Soc. Wash.* 96(4):632-637. 29 Dec. 1983. SFA 29(1)
[J. L. B. Smith Inst., Ichthyol., P. B. 1015, Grahamstown 6140, South Africa]

84-000523 Jewett, S. L. and E. A. Lachner. SEVEN NEW SPECIES OF THE INDO-PACIFIC GENUS *EVIOTA* (PISCES: GOBIIDAE). *Proc. Biol. Soc. Wash.* 96(4):780-806. 29 Dec. 1983. SFA 29(1)
[Dep. Vert. Zool. (Fishes), Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC 20560]

84-000524 Kottelat, M. A NEW SPECIES OF *ERETHISTES* MÜLLER & TROSCHEL FROM THAILAND AND BURMA (OSTEICHTHYES: SILURIFORMES: SISORIDAE). *Hydrobiologia* 107(1):71-74. 21 Oct. 1983. SFA 29(1)
[Naturhist. Mus., Augustinergasse 2, 4001 Basel, Switzerland]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-000525 Markle, D. F.; J. T. Williams and J. E. Olney. DESCRIPTION OF A NEW SPECIES OF *ECHIODON* (TELEOSTEI: CARAPIDAE) FROM ANTARCTIC AND ADJACENT SEAS. *Proc. Biol. Soc. Wash.* 96(4):645-657. 29 Dec. 1983. SFA 29(1)
[Huntsman Mar. Lab., St. Andrews, NB E0G 2X0, Canada]

84-000526 Menezes, N. A. and J. Gery. SEVEN NEW *ACESTRORHYNCHIN* CHARACID SPECIES (OSTEICHTHYES, OSTARIOPHYSI, CHARACIFORMES) WITH COMMENTS ON THE SYSTEMATICS OF THE GROUP. *Rev. Suisse Zool.* 90(3):563-592. Sept. 1983. SFA 29(1)
[Mus. Zool., Univ. São Paulo, Caixa Postal 7172, 01000, São Paulo, Brazil]

84-000527 Merrett, N. R. A NEW SPECIES OF THE DEEP-SEA FISH GENUS *PARALIPARIS* COLLETT (LIPARIDIDAE) FROM THE EASTERN NORTH ATLANTIC, WITH NOTES ON ITS ECOLOGY. *J. Fish Biol.* 23(4):429-439. Oct. 1983. SFA 29(1)
[Inst. Oceanogr. Sci., Wormley, Godalming, Surrey, England]

84-000528 Miller, R. R. *RHAMDIA REDDELLI*, NEW SPECIES, THE FIRST BLIND PIMELODID CATFISH FROM MIDDLE AMERICA, WITH A KEY TO THE MEXICAN SPECIES. *Trans. San Diego Soc. Nat. Hist.* 20(8):135-144. 18 Jan. 1984. SFA 29(1)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

84-000529 Nelson, D. W. SYSTEMATICS AND DISTRIBUTION OF COTTID FISHES OF THE GENERA *RASTRINUS* AND *ICELUS*. *Calif. Acad. Sci. Occas. Pap.* No. 138. 58p. 17 Jan. 1984. SFA 29(1)
[Sch. Fish., Coll. Ocean Fish. Sci., Univ. Wash., Seattle 98195]

84-000530 Page, L. M. and L. E. Cordes. VARIATION AND SYSTEMATICS OF *ETHEOSTOMA EUZONUM*, THE ARKANSAS SADDLED DARTER (PISCES: PERCIDAE). *Copeia* 1983(4):1042-1050. 14 Dec. 1983. SFA 29(1)
[Ill. Nat. Hist. Surv., Champaign 61820]

84-000531 Page, L. M. IDENTIFICATION OF THE PERCIDS, *BOLEOSOMA PHLOX* COPE AND *IOA VIGIL* HAY. *Copeia* 1983(4):1082-1083. 14 Dec. 1983. SFA 29(1)
[Ill. Nat. Hist. Surv., Champaign 61820]

84-000532 Randall, J. E. REVISION OF THE INDO-PACIFIC LABRID FISH GENUS *WETMORELLA*. *Copeia* 1983(4):875-883. 14 Dec. 1983. SFA 29(1)
[Bernice P. Bishop Mus., Box 19000-A, Honolulu, HI 96819]

84-000533 Roberts, T. R. and M. Kottelat. DESCRIPTION AND OSTEOLOGY OF *THRYSSOCYPRIS*, A NEW GENUS OF ANCHOVYLIKE CYPRINID FISHES, BASED ON TWO NEW SPECIES FROM SOUTHEAST ASIA. *Proc. Calif. Acad. Sci.* 43(11):141-158. 17 Jan. 1984. SFA 29(1)
[Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-000534 Russo, J. L. INTERRELATIONSHIPS OF THE GEMPYLID FISHES (TELEOSTEI, SCOMBROIDEI). *Ph.D. dissertation, George Washington Univ.* 380p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1379. Nov. 1983. SFA 29(1)

84-000535 Vari, R. P. PHYLOGENETIC RELATIONSHIPS OF THE FAMILIES CURIMATIDAE, PROCHILODONTIDAE, ANOSTOMIDAE, AND CHILODONTIDAE (PISCES, CHARACIFORMES). *Smithsonian Contrib. Zool.* No. 378. 60p. 1983. From Monthly Catalog of U.S. Gov. Publ. p. 170. Nov. 1983. SFA 29(1)

84-000536 Villwock, W.; A. Scholl and F. Krupp. ZUR TAXONOMIE, VERBREITUNG UND SPEZIALISATION DES FORMENKREISES *APHANIUS DISPAR* (RÜPPELL, 1828) UND BESCHREIBUNG VON *APHANIUS SIRHANI* N. SP. (PISCES: CYPRINODONTIDAE). [THE TAXONOMY, DISTRIBUTION, AND SPECIATION OF *APHANIUS DISPAR* (RÜPPELL, 1828) AND DESCRIPTION OF *APHANIUS SIRHANI* N. SP. (PISCES: CYPRINODONTIDAE).] *Mitt. Hamb. Zool. Mus. Inst.* 80:251-277. 1983. In German with English summ. SFA 29(1)

[Zool. Inst. Zool. Mus., Univ. Hamburg, Martin-Luther-King-Pl. 3, D-2000 Hamburg 13, West Germany]

84-000537 Weitzman, S. H. and W. L. Fink. RELATIONSHIPS OF THE NEON TETRAS, A GROUP OF SOUTH AMERICAN FRESHWATER FISHES (TELEOSTEI, CHARACIDAE), WITH COMMENTS ON THE PHYLOGENY OF NEW WORLD CHARACIFORMS. *Bull. Mus. Comp. Zool. Harvard Univ.* 150(6):339-395. 22 Dec. 1983. SFA 29(1)
[Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC 20560]

84-000538 Williams, J. T. and A. M. Smart. REDESCRIPTION OF THE BRAZILIAN LABRISOMID FISH *STARKSIA BRASILIENSIS*. *Proc. Biol. Soc. Wash.* 96(4):638-644. 29 Dec. 1983. SFA 29(1)

[Div. Fish., Natl. Mus. Nat. Hist., Smithsonian Inst., Washington, DC 20560]

84-000539 Winterbottom, R. and J. C. Tyler. PHYLOGENETIC RELATIONSHIPS OF ARACANIN GENERA OF BOXFISHES (OSTRACIIDAE: TETRAODONTIFORMES). *Copeia* 1983(4):902-917. 14 Dec. 1983. SFA 29(1)

[Dep. Ichthyol. Herpetol., R. Ont. Mus., Toronto, ON M5S 2C6, Canada]

PARASITES AND DISEASES-GENERAL

84-000540 Bucke, D.; S. W. Feist; M. G. Norton and M. S. Rolfe. A HISTOPATHOLOGICAL REPORT OF SOME EPIDERMAL ANOMALIES OF DOVER SOLE, *SOLEA SOLEA* L., AND OTHER FLATFISH SPECIES IN COASTAL WATERS OFF SOUTH-EAST ENGLAND. *J. Fish Biol.* 23(5):565-578. Nov. 1983. SFA 29(1)

[Minist. Agric. Fish. Food, Dir. Fish. Res., Fish Dis. Lab., Weymouth, Dorset DT4 8UB, England]

84-000541 Moles, A. PARASITE-HOST RECORDS OF ALASKAN FISHES. *NOAA Tech. Rep. NMFS-SSRF* 760. iii + 41p. Sept. 1982. SFA 29(1)

[NMFS, P.O. Box 155, Auke Bay, AK 99821]

PARASITES AND DISEASES-GENERAL (CONTINUED)

84-000542 Mpoame, M. and J. N. Rinne. PARASITES OF SOME FISHES NATIVE TO ARIZONA AND NEW MEXICO. *Southwest. Nat.* 28(4):399-405. 9 Dec. 1983. SFA 29(1)

[For. Sci. Lab., Ariz. State Univ., Tempe 85287]

84-000543 Price, P. W. and K. M. Clancy. PATTERNS IN NUMBER OF HELMINTH PARASITE SPECIES IN FRESHWATER FISHES. *J. Parasitol.* 69(3):449-454. June 1983. SFA 29(1)

[Dep. Biol. Sci., North Ariz. Univ., Box 5640, Flagstaff 86011]

84-000544 Soderberg, R. W. GROWTH, SURVIVAL AND HISTOPATHOLOGY OF RAINBOW TROUT AND CHANNEL CATFISH IN INTENSIVE STATIC-WATER CULTURE. *Ph.D dissertation, Auburn Univ.* 59p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2024. Jan. 1984. SFA 29(1)

84-000545 Thune, R. L. and J. A. Plumb. EVALUATION OF HYPEROSMOTIC INFILTRATION FOR THE ADMINISTRATION OF ANTIGEN TO CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Aquaculture* 36(1-2):1-8. 1 Jan. 1984. SFA 29(1)

[Dep. Vet. Microbiol. Parasitol., Sch. Vet. Med., La. State Univ., Baton Rouge 70803] Conditions affecting the hyperosmotic infiltration of antigens into channel catfish were examined using bovine serum albumin as a model antigen. A two-step procedure involving a 1-min presoak in 3% NaCl and a 30-s immersion in antigen resulted in maximum antigen uptake with minimal handling time. Maximum serum antigen levels at 27°C occurred immediately after immersion while maximum serum antigen levels at 16°C occurred at 30 min post-infiltration. Due to the rapidity of uptake, the gills are postulated as the primary site of antigen uptake in the channel catfish. Anesthetics were ineffective in increasing antigen uptake, and in fact had the opposite effect.

84-000546 Toor, H. S.; H. S. Sehgal and R. S. Sehdev. A CASE STUDY OF ACUTE FISH DISEASES IN TANKS LOADED WITH HIGH LEVELS OF ORGANIC MANURES. *Aquaculture* 35(4):277-282. Dec. 1983. SFA 29(1)

[Fish. Res. Complex, Dep. Zool., Punjab Agric. Univ., Ludhiana 141 004, India] Two acute fish diseases, hemorrhagic septicemia, caused by *Aeromonas punctata* Snieszko and saprolegniasis caused by *Saprolegnia parasitica* Coker, were observed in an Indian major carp, *Labeo rohita* (Ham.). Common carp (*Cyprinus carpio* Linn.) suffered only from early stages of hemorrhagic septicemia. The diseases were prevalent only in winter and in tanks with a high organic load.

84-000547 U.S. Fish and Wildlife Service. PROPAGATION AND DISTRIBUTION OF FISHES FROM NATIONAL FISH HATCHERIES FOR FISCAL YEAR 1982. *U.S. Fish Wildl. Serv. Fish. Dist. Rep.* 17. 80p. 1983. SFA 29(1)

[Washington, DC 20240]

84-000548 Worlund, D. D. and G. Taylor. ESTIMATION OF DISEASE INCIDENCE IN FISH POPULATIONS. *Can. J. Fish. Aquatic Sci.* 40(12):2194-2197. Dec. 1983. In English with French summ. SFA 29(1)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

BACTERIAL DISEASES

84-000549 Colorni, A. and I. Paperna. EVALUATION OF NITROFURAZONE BATHS IN THE TREATMENT OF BACTERIAL INFECTIONS OF *SPARUS AURATA* AND *OREOCHROMIS MOSSAMBICUS*. *Aquaculture* 35(3):181-186. Nov. 1983. SFA 29(1)
[Isr. Oceanogr. Limnol. Res., Maricult. Lab., Elat, Israel]

84-000550 Davis, J. F. and S. S. Hayasaka. PATHOGENIC BACTERIA ASSOCIATED WITH CULTURED AMERICAN EELS, *ANGUILLA ROSTRATA* LE SUEUR. *J. Fish Biol.* 23(5):557-564. Nov. 1983. SFA 29(1)
[Dep. Microbiol., Clemson Univ., Clemson, SC 29631]

84-000551 Ferguson, H. W.; M. J. Claxton; R. D. Moccia and E. J. Wilkie. THE QUANTITATIVE CLEARANCE OF BACTERIA FROM THE BLOODSTREAM OF RAINBOW TROUT (*SALMO GAIIRDNERI*). *Vet. Pathol.* 19(6):687-699. Nov. 1982. SFA 29(1)
[Dep. Pathol., Ontario Vet. Coll., Univ. Guelph, Guelph, ON, Canada]

84-000552 Ishihara, S. and R. Kusuda. [VARIATIONS IN VIABLE CELL COUNTS OF RELEASED *EDWARDSIELLA TARDA* FROM EXPERIMENTALLY INFECTED EEL AT DIFFERENT TEMPERATURES.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1341-1345. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Fish Dis. Lab., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

84-000553 Kimura, T.; M. Yoshimizu and M. Wada. *IN VITRO* ANTIBACTERIAL ACTIVITY OF THE COMBINATION OF SULPHADIAZINE AND TRIMETHOPRIM ON BACTERIAL FISH PATHOGENS. *J. Fish Dis.* 6(6):525-532. Nov. 1983. SFA 29(1)
[Lab. Microbiol., Fac. Fish., Hokkaido Univ., Minato 3-1-1, Hakodate 041, Japan]

84-000554 Roberts, M. S. A REPORT OF AN EPIZOOTIC IN HATCHERY REARED RAINBOW TROUT, *SALMO GAIIRDNERI* RICHARDSON, AT AN ENGLISH TROUT FARM, CAUSED BY *YERSINIA RUCKERI*. *J. Fish Dis.* 6(6):551-552. Nov. 1983. SFA 29(1)
[South. Water Auth., Worthing, Sussex, BN11 1LD U.K.]

84-000555 Taniguchi, M. [PROGRESS OF STREPTOCOCCICOSIS OF YELLOWTAIL IN PERORAL INOCULATION.] *Bull. Jpn. Soc. Sci. Fish.* 49(8):1171-1174. Aug. 1983. In Japanese with English summ. SFA 29(1)
[Kochi Pref. Freshwater Fish. Lab., Tosayamada, Kochi 782, Japan]

FUNGAL DISEASES

84-000556 Ellis, A. E.; I. F. Waddell and D. W. Minter. A SYSTEMIC FUNGAL DISEASE IN ATLANTIC SALMON PARR, *SALMO SALAR* L., CAUSED BY A SPECIES OF *PHIALOPHORA*. *J. Fish Dis.* 6(6):511-523. Nov. 1983. SFA 29(1)
[Mar. Lab., P.O. Box 101, Victoria Rd., Aberdeen AB9 8DB, Scotland] A fungal infection of Atlantic Salmon parr (0+) occurring at low water temperatures, principally in January, is reported from fish farm hatcheries in western Scotland. Clinical signs and histopathology of the disease are described, illustrated, discussed and compared with those of certain other

SPORT FISHERY ABSTRACTS

FUNGAL DISEASES (CONTINUED)

84-000556 CONTINUED fungal diseases of salmonids. The fungus, provisionally placed in the hyphomycete genus *Phialophora* is described and illustrated from pure culture, with a discussion of its taxonomic position.

PROTOZOAN DISEASES

84-000557 Ahmed, A. T. A. SKIN MYXOBOLIASIS OF A MAJOR CARP (*LABEO ROHITA*) IN BANGLADESH. *Fish Health News* 11(4):i-ii. Oct. 1982. SFA 29(1)
[Dep. Zool., Univ. Dhaka, Dhaka, Bangladesh]

84-000558 Hawkins, W. E.; J. W. Fournie and R. M. Overstreet. ORGANIZATION OF SPORULATED OOCYSTS OF *EIMERIA FUNDULI* IN THE GULF KILLIFISH, *FUNDULUS GRANDIS*. *J. Parasitol.* 69(3):496-503. June 1983. SFA 29(1)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

84-000559 Lacey, S. M. and I. C. Williams. *EPIEIMERIA ANGUILLAE* (LÉGER & HOLLANDE, 1922) DYKOVÁ & LOM, 1981 (APICOMPLEXA: EUCCOCIDIA) IN THE EUROPEAN EEL, *ANGUILLA ANGUILLA* (L.). *J. Fish Biol.* 23(5):605-609. Nov. 1983. SFA 29(1)
[Dep. Zool., The University, Hull, North Humberside HU6 7RX, England]

84-000560 Lowe-Jinde, L. and A. J. Niimi. IS *TRYPANOPLASMA SALMOSITICA* PRESENT IN LAKE ONTARIO SALMONIDS? *J. Great Lakes Res.* 9(4):588-589. 1983. SFA 29(1)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

84-000561 Paperna, I. and J. G. Van As. THE PATHOLOGY OF *CHILODONELLA HEXASTICHA* (KIERNIK). INFECTIONS IN CICHLID FISHES. *J. Fish Biol.* 23(4):441-450. Oct. 1983. SFA 29(1)
[H. Steinitz Mar. Biol. Lab., Hebrew Univ. Jerusalem, Eilat, Israel]

84-000562 Post, G. and K. R. Vesely. ADMINISTRATION OF DRUGS BY HYPEROSMOTIC OR VACUUM INFILTRATION OR SURFACTANT IMMERSION INEFFECTIVE FOR CONTROL OF INTRADERMALLY ENCYSTED *ICHTHYOPHTHIRIUS MULTIFILIIS*. *Prog. Fish-Cult.* 45(3):164-166. July 1983. SFA 29(1)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

VIRAL DISEASES

84-000563 Amend, D. F.; T. McDowell and R. P. Hedrick. ISOLATION OF A REOVIRUS FROM CHANNEL CATFISH (*ICTALURUS PUNCTATUS*). *Fish Health News* 11(4):iii-v. Oct. 1982. SFA 29(1)
[Aquacult. Prog., Dep. Anim. Sci., Univ. Calif., Davis 94923]

84-000564 Berry, E. S.; T. B. Shea and J. Gabliks. TWO IRIDOVIRUS ISOLATES FROM *CARASSIUS AURATUS* (L.). *J. Fish Dis.* 6(6):501-510. Nov. 1983. SFA 29(1)
[Dep. Biol., Northeastern Univ., Boston, MA 02115]

SPORT FISHERY ABSTRACTS

VIRAL DISEASES (CONTINUED)

84-000565 Burke, J. and D. Mulcahy. RETENTION OF INFECTIOUS HAEMATOPOIETIC NECROSIS VIRUS INFECTIVITY IN FISH TISSUE HOMOGENATES AND FLUIDS STORED AT THREE TEMPERATURES. *J. Fish Dis.* 6(6):543-547. Nov. 1983. SFA 29(1)

[D. Mulcahy: U.S. FWS, Natl. Fish Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

84-000566 Dea, S. and M. A. S. Y. Elazhary. COUNTERIMMUNOELECTROPHORESIS FOR IDENTIFICATION OF INFECTIOUS PANCREATIC NECROSIS VIRUS AFTER ISOLATION IN CELL CULTURE. *Can. J. Fish. Aquatic Sci.* 40(12):2200-2203. Dec. 1983. In English with French summ. SFA 29(1)

[Dep. Pathol. Microbiol., Fac. Med. Vet., Univ. Montreal, C. P. 5000, St-Hyacinthe, PQ J2S 7C6, Canada]

84-000567 Robin, J. and C. Larivière-Durand. BLUEGILL VIRUS IS A RIBOVIRUS OF POSITIVE-STRAND POLARITY. *Arch. Virol.* 77(2-4):119-125. 1983. SFA 29(1)

[Dep. Biol., Fac. Sci., Univ. Sherbrooke, Sherbrooke, PQ, Canada] RNA was extracted from purified Bluegill virus (BGV) and fractionated onto a poly (U)-Sephrose-4 B column. More than 70 per cent of this RNA became bound and could be subsequently eluted from the column. By polynucleotide phosphorylase digestion, the poly (A) sequences were located at the 3'-terminus of the RNA. This RNA and purified BGV RNA were infectious as shown by plaque assay titration of the virus produced. Furthermore, we were unable to detect RNA polymerase activity in preparations of BGV. These results indicate that the genome in the BGV particle is a positive-strand RNA.

84-000568 Sano, T.; H. Fukuda; N. Okamoto and F. Kaneko. YAMAME TUMOR VIRUS: LETHALITY AND ONCOGENICITY. *Bull. Jpn. Soc. Sci. Fish.* 49(8):1159-1163. Aug. 1983. SFA 29(1)

[Lab. Fish Pathol., Tokyo Univ. Fish., 4-5-7 Konan, Minato, Tokyo, Japan]

OTHER DISEASES AND PARASITES

84-000569 Amin, O. M. and E. H. Williams, Jr. *ACANTHOCEPHALUS ALABAMENSIS* SP. N. (ACANTHOCEPHALA: ECHINORHYNCHIDAE) FROM ALABAMA FISHES. *J. Parasitol.* 69(4):764-768. Aug. 1983. SFA 29(1)

[Sci. Div., Univ. Wis.-Parkside, Kenosha 53141]

84-000570 Black, G. A. *CYSTIDICOLA FARIONIS* (NEMATODA) AS AN INDICATOR OF LAKE TROUT (*SALVELINUS NAMAYCUSH*) OF BERING ANCESTRY. *Can. J. Fish. Aquatic Sci.* 40(11):2034-2040. Nov. 1983. In English with French summ. SFA 29(1)

[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

84-000571 de Oliveria Malta, J. C. OS ARGULIDEOS (CRUSTACEA: BRANCHIURA) DA AMAZÔNIA BRASILEIRA. ASPECTOS DA ECOLOGIA DE *DOLOPS DISCOIDALIS* BOUVIER, 1899 E *DOLOPS BIDENTATA* BOUVIER, 1899. [THE ARGULIDS (CRUSTACEA: BRANCHIURA) OF AMAZON BRAZIL. ASPECTS OF ECOLOGY OF *DOLOPS DISCOIDALIS* BOUVIER, 1899 AND *DOLOPS BIDENTATA* BOUVIER, 1899.] *Acta Amazonica* 12(3):521-528. Sept. 1982. In Portuguese with English summ. SFA 29(1)

[Inst. Nac. Pesq. Amazônia, Manaus, Brazil]

OTHER DISEASES AND PARASITES (CONTINUED)

84-000572 de Oliveria Malta, J. C. OS ARGULIDEOS (CRUSTACEA: BRANCHIURA) DA AMAZÔNIA BRASILEIRA, 2. ASPECTOS DA ECOLOGIA DE *DOLOPS GEAYI* BOUVIER, 1897 E *ARGULUS JUPARANAENSIS* CASTRO, 1950. [THE ARGULIDS (CRUSTACEA: BRANCHIURA) OF AMAZON BRAZIL, 2. ASPECTS OF THE ECOLOGY OF *DOLOPS GEAYI* BOUVIER, 1897 AND *ARGULUS JUPARANAENSIS* CASTRO, 1950.] *Acta Amazonica* 12(4):701-705. Dec. 1982. In Portuguese with English summ. SFA 29(1)
[Inst. Nac. Pesq. Amazônia, Manaus, Brazil]

84-000573 Dojiri, M. REVISION OF THE GENERA OF THE CALIGIDAE (SIPHONOSTOMATOIDA), COPEPODS PREDOMINANTLY PARASITIC OF MARINE FISHES. Ph.D. dissertation, Boston Univ. Grad. Sch. 74lp. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(5):1375. Nov. 1983. SFA 29(1)

84-000574 Dunn, I. J.; L. R. Russell and J. R. Adams. CECAL HISTOPATHOLOGY CAUSED BY *TRUTTAEDACNITIS TRUTTAE* (NEMATODA: CUCULLANIDAE) IN RAINBOW TROUT, *SALMO GAIARDNERI*. *Int. J. Parasitol.* 13(5):441-445. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

84-000575 Giles, N. BEHAVIOURAL EFFECTS OF THE PARASITE *SCHISTOCEPHALUS SOLIDUS* (CESTODA) ON AN INTERMEDIATE HOST, THE THREE-SPINED STICKLEBACK, *CASTEROSTEUS ACULEATUS* L. *Anim. Behav.* 31(4):1192-1194. Nov. 1983. SFA 29(1)
[Sch. Life Sci., Univ. Buckingham, Buckingham, England]

84-000576 Granath, W. O., Jr. and G. W. Esch. SURVIVORSHIP AND PARASITE-INDUCED HOST MORTALITY AMONG MOSQUITOFISH IN A PREDATOR-FREE, NORTH CAROLINA COOLING RESERVOIR. *Am. Midl. Nat.* 110(2):314-323. Oct. 1983. SFA 29(1)
[Dep. Zool., Univ. Okla., Norman 73019]

84-000577 Ho, J.; T. T. Do and S. Kasahara. COPEPODS OF THE FAMILY BOMOLOCHIDAE PARASITIC ON FISHES OF KOJIMA BAY, OKAYAMA PREFECTURE. *J. Fac. Appl. Biol. Sci. Hiroshima Univ.* 22(1):1-41. Aug. 1983. In English with Japanese summ. SFA 29(1)
[Dep. Biol., Calif. State Univ., Long Beach 90840]

84-000578 Lemly, A. D. and G. W. Esch. DIFFERENTIAL SURVIVAL OF METACERCARIAE OF *UVULIFER AMBLOPLITIS* (HUGHES, 1927) IN JUVENILE CENTRARCHIDS. *J. Parasitol.* 69(4):746-749. Aug. 1983. SFA 29(1)
[Dep. Biol., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada]

84-000579 Llewellyn, J. SPERM TRANSFER IN THE MONOGENEAN GILL PARASITES *GASTROCOTYLE TRACHURI*. *Proc. R. Soc. Lond. B Biol. Sci.* 219(1217):439-446. 22 Oct. 1983. SFA 29(1)
[Dep. Zool. Comp. Physiol., The University, P.O. Box 363, Birmingham B15 2TT, U.K.]

SPORT FISHERY ABSTRACTS

OTHER DISEASES AND PARASITES (CONTINUED)

- 84-000580 Meyers, T. R. and J. D. Hendricks. HISTOPATHOLOGY OF FOUR SPONTANEOUS NEOPLASMS IN THREE SPECIES OF SALMONID FISHES. *J. Fish Dis.* 6(6):481-499. Nov. 1983. SFA 29(1)
[Sch. Fish. Sci., Univ. Alaska, 11120 Glacier Highway, Juneau 99801]
- 84-000581 Mishra, B. K. and D. Kumar. A CASE OF HERNIA IN *CATLA CATLA* (HAMILTON). *J. Fish Dis.* 6(6):549. Nov. 1983. SFA 29(1)
[CIFRI, Dhauli, P.O. Kausalyagang, Via-Bhubaneswar 2, Orissa, India 751002]
- 84-000582 Peters, N.; W. Schmidt; H. Kranz and H. F. Stich. NUCLEAR INCLUSIONS IN THE X-CELLS OF SKIN PAPILLOMAS OF PACIFIC FLATFISH. *J. Fish Dis.* 6(6):533-536. Nov. 1983. SFA 29(1)
[Zool. Inst., Univ. Hamburg, 2000 Hamburg 13, Martin-Luther-King-Platz 3, West Germany]
- 84-000583 Pike, A. W. and M. D. B. Burt. THE TISSUE RESPONSE OF YELLOW PERCH, *PERCA FLAVESCENS* MITCHILL TO INFECTIONS WITH THE METACERCARIAL CYST OF *APOPHALLUS BREVIS* RANSOM, 1920. *Parasitology* 87(3):393-404. Dec. 1983. SFA 29(1)
[Dep. Zool., Univ. Aberdeen, Tillydrone Ave., Aberdeen, Scotland AB9 2TN]
- 84-000584 Richards, C. M. and T. J. Lynch. A SERUM COMPONENT WHICH INDUCES MELANIZATION IN A GOLDFISH TUMOR LINE. *Am. Zool.* 23(4):996. 1983. Abstract only. SFA 29(1)
[Wayne State Univ., Detroit, MI]
- 84-000585 Sandifer, P. A. and J. H. Kerby. EARLY LIFE HISTORY AND BIOLOGY OF THE COMMON FISH PARASITE, *LIRONECA OVALIS* (SAY) (ISOPODA, CYMOTHODAE). *Estuaries* 6(4):420-425. Dec. 1983. SFA 29(1)
[Mar. Resour. Res. Inst., P.O. Box 12559, Charleston, SC 29412]
- 84-000586 Scott, P. W. and B. Fogle. TREATMENT OF ORNAMENTAL KOI CARP (*CYPRINUS CARPIO*) INFECTED WITH ANCHOR WORMS (*LERNAEA CYPRINACEA*). *Vet. Rec.* 113(18):421. 29 Oct. 1983. SFA 29(1)
[12 Landguard Rd., Southampton, England]
- 84-000587 Smith, J. D. DEVELOPMENT AND SEASONAL TRANSMISSION OF *RAPHIDASCARIS ACUS* (NEMATODA, ANISAKIDAE), A PARASITE OF FISHES, WITH A REVISION OF THE GENUS. *Ph.D. dissertation, Univ. Guelph (Canada)* 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1747. Dec. 1983. SFA 29(1)
- 84-000588 Smith, J. W. *ANISAKIS SIMPLEX* (RUDOLPHI, 1809, DET. KRABBE, 1878) (NEMATODA: ASCARIDOIDEA): MORPHOLOGY AND MORPHOMETRY OF LARVAE FROM EUPHAUSIIDS AND FISH, AND A REVIEW OF THE LIFE-HISTORY AND ECOLOGY. *J. Helminthol.* 57(3):205-224. Sept. 1983. SFA 29(1)
[Mar. Lab., Aberdeen, Scotland]
- 84-000589 Torres, P.; L. Figueroa and R. Franjola. PSEUDOPHYLLIDAE IN THE SOUTH OF CHILE. IX. TYPES OF PLEROCERCOIDS IN TROUTS FROM FIVE LAKES AND NEW CASES OF *CIPHYLLOBOTHRIUM LATUM* IN MAN AND *D. PACIFICUM* IN A DOG.

OTHER DISEASES AND PARASITES (CONTINUED)

- 84-000589 CONTINUED *Int. J. Zoonoses* 10(1):15-21. June 1983. SFA 29(1)
[Inst. Parasitol., Fac. Med., Univ. Austral Chile, Valdivia, Chile]
- 84-000590 Weekes, P. J. OCCASIONAL NOTES ON PARASITES IN THE NEW ZEALAND FAUNA. I. A NEW HOST FOR *DERETREMA PHILIPPAE* HINE 1977. *Tuatara* 26(2):60-61. Nov. 1983. SFA 29(1)
[Zool. Dep., Victoria Univ., Wellington, New Zealand]
- 84-000591 Winch, J. THE BIOLOGY OF *ATRISPINUM LABRACIS* N. COMB. (MONOGENEA) ON THE GILLS OF THE BASS, *DICENTRARCHUS LABRAX*. *J. Mar. Biol. Assoc. U.K.* 63(4):915-927. Nov. 1983. SFA 29(1)
[Dep. Biol. Sci., The University, Dundee DD1 4HN, Scotland]

POLLUTION

- 84-000592 Barber, R. T. and P. J. Whaling. MERCURY IN MARLIN AND SAILFISH. *Mar. Pollut. Bull.* 14(10):395-396. Oct. 1983. SFA 29(1)
[Duke Univ. Mar. Lab., Beaufort, NC 28516]
- 84-000593 Bergheim, A.; H. Hustveit; A. Kittelsen and A. R. Selmer-Olsen. ESTIMATED POLLUTION LOADINGS FROM NORWEGIAN FISH FARMS. II. INVESTIGATIONS 1980-1981. *Aquaculture* 36(1-2):157-168. 1 Jan. 1984. SFA 29(1)
[Dir. Wildl. Freshwater Fish, 1432 As-NLH, Norway]
- 84-000594 Brown, G. M., Jr. and V. F. Gallucci. BIOECONOMIC CONSEQUENCES FOR A FISHERY DEPENDENT UPON A BENTHIC COMMUNITY PERTURBED BY PETROLEUM. (FISCAL YEAR 1980). *Univ. Wash.* 87p. 1980. From U.S. Government Reports 83(10):2137. 13 May 1983. Available from NTIS as PB83-151910. SFA 29(1)
- 84-000595 Campbell, K. P.; S. R. Johnson and K. U. Wolniakowski. A PILOT STUDY OF POTENTIAL PHENOLIC CONTAMINATION OF FISHES IN THE COLUMBIA RIVER AND TRIBUTARIES IN THE VICINITY OF MOUNT ST. HELENS. *Beak Consultants, Inc.* 32p. June 1982. From U.S. Government Reports 83(8):1530. 15 Apr. 1983. Available from NTIS as PB83-146357. SFA 29(1)
- 84-000596 Chadwick, J. W. and S. P. Canton. COAL MINE DRAINAGE EFFECTS ON A LOTIC ECOSYSTEM IN NORTHWEST COLORADO, U.S.A. *Hydrobiologia* 107(1):25-33. 21 Oct. 1983. SFA 29(1)
[Chadwick & Assoc., 4901 East Dry Creek Rd., Littleton, CO 80122] An aquatic biological survey was conducted in 1979-1980 to determine the effects of drainage from an active coal strip-mine on Trout Creek, in northwest Colorado, U.S.A. Sampling was conducted over four seasons at four stations for periphyton, benthic invertebrates and fish. Periphyton in Trout Creek changed in the relative abundance of algae divisions in no apparent relation to mining. Diatoms were the predominant division at all sites. Golden-brown algae were abundant in spring at the stations upstream and adjacent to the mine. Blue-green algae were relatively important at stations upstream and downstream of the mine in winter. Benthic invertebrates exhibited a progressive increase in density, biomass and number of taxa from the upstream station to the downstream station. Shannon-Wiener diversity index for benthic

POLLUTION (CONTINUED)

84-000596 CONTINUED invertebrates decreased slightly downstream of mine drainage but remained indicative of a clean water community. Aquatic insects (especially Trichoptera) were the predominant invertebrates at all stations. Analysis of functional groups of benthic invertebrates revealed increased importance of collector species at the lower sites while shredders were most important upstream of the mine. Unlike the invertebrates, fish exhibited slightly lower biomass at the station adjacent to the mine. The decrease was due to fewer salmonids. However, salmonid density and biomass increased substantially at the station just downstream of the mine. Non-game species (suckers and minnows) increased in numbers downstream and were most abundant at the lowest station. This coal strip-mine had little discernable adverse effects on the periphyton and invertebrates of Trout Creek. Fish populations did not appear to be significantly affected by the mine. Apparently, the presence of settling ponds and a buffer zone of unmined land between the mine and the stream helped to minimize adverse effects.

84-000597 Eilers, J. M.; G. E. Glass; K. E. Webster and J. A. Rogalla. HYDROLOGIC CONTROL OF LAKE SUSCEPTIBILITY TO ACIDIFICATION. *Can. J. Fish. Aquatic Sci.* 40(11):1896-1904. Nov. 1983. In English with French summ. SFA 29(1)

[Wis. Dep. Nat. Resour., P.O. Box 818, Rhinelander 54501]

84-000598 FAO of the UN. WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON CHROMIUM AND FRESHWATER FISH. *EIFAC Tech. Pap.* No. 43. vi + 31p. 1983. SFA 29(1)

[Rome, Italy]

84-000599 FAO of the UN. MANUAL OF METHODS IN AQUATIC ENVIRONMENT RESEARCH. PART 9. ANALYSES OF METALS AND ORGANOCHLORINES IN FISH. *FAO Fish. Tech. Pap.* No. 212. vii + 33p. 1983. SFA 29(1)

[Rome, Italy]

84-000600 Foggin, G. T. III and B. R. McClelland. INFLUENCE OF KOKANEE SALMON AND MAN ON THE WATER QUALITY OF LOWER MCDONALD CREEK, GLACIER NATIONAL PARK, MONTANA. *Mont. Water Resour. Res. Cent. OWRT-A-122-MONT*(1). 70p. Jan. 1983. From U.S. Government Reports 83(15):3554. 22 July 1983. Available from NTIS as PB83-186478. SFA 29(1)

84-000601 Freeman, H. C.; G. B. Sangalang; J. F. Uthe; E. T. Garside and P. G. Daye. A HISTOPATHOLOGICAL EXAMINATION OF, AND ANALYSIS FOR POLYCHLORINATED HYDROCARBONS IN, INSHORE ATLANTIC COD (*GADUS MORHUA*). *Arch. Environ. Contam. Toxicol.* 12(6):627-632. Nov. 1983. SFA 29(1)

[Halifax Fish. Res. Lab., P.O. Box 550, Halifax, NS B3L 4L5, Canada]

84-000602 Gossett, R. W.; D. A. Brown and D. R. Young. PREDICTING THE BIOACCUMULATION OF ORGANIC COMPOUNDS IN MARINE ORGANISMS USING OCTANOL/WATER PARTITION COEFFICIENTS. *Mar. Pollut. Bull.* 14(10):387-392. Oct. 1983. SFA 29(1)

[South Calif. Coast. Water Res. Proj., 646 W. Pacific Coast Highway, Long Beach 90806]

POLLUTION (CONTINUED)

84-000603 Grizzle, J. M. and P. Melius. CAUSES OF PAPILLOMAS ON FISH LIVING IN CHLORINATED SEWAGE EFFLUENT. *U.S. Environ. Prot. Agency* 600/S3-82-087 2p. Feb. 1983. From Monthly Catalog of U.S. Gov. Publ. p. 76. Nov. 1983. SFA 29(1)

84-000604 Hall, L. W., Jr.; S. L. Margrey; D. T. Burton and W. C. Graves. AVOIDANCE BEHAVIOR OF JUVENILE STRIPED BASS, *MORONE SAXATILIS*, SUBJECTED TO SIMULTANEOUS CHLORINE AND ELEVATED TEMPERATURE CONDITIONS. *Arch. Environ. Contam. Toxicol.* 12(6):715-720. Nov. 1983. SFA 29(1)

[Johns Hopkins Univ., Appl. Physics Lab., Aquatic Ecol. Sect., Shady Side, MD 20764] The avoidance responses of juvenile striped bass (*Morone saxatilis*) were evaluated by exposing test organisms to simultaneous elevated temperature (0, 2, 4, and 6°C) and total residual chlorine (TRC) (0.00, 0.05, 0.10 and 0.15 mg/L) conditions at four acclimation temperatures ranging from 15-30°C. An unbalanced 3-factor factorial design was used to develop response surface avoidance models at all acclimation temperatures. The percent avoidance models at 15°C showed that the interaction term (TRC x ΔT) was the most important term influencing avoidance; TRC was the most important factor at 20°C; the models at 25 and 30°C showed that ΔT was the most important factor. The results of tests conducted at 15°C suggest that preference for a higher temperature overrides a chlorine avoidance response to 0.15 mg/L TRC. Avoidance responses of striped bass tested at acclimation temperatures of 20, 25, and 30°C showed that preference for a higher temperature (6°C ΔT) did not override a chlorine avoidance response. A significant difference ($p < 0.01$) existed between avoidance models at all acclimation temperatures; greatest avoidance generally occurred for all combinations of test conditions at 30°C.

84-000605 Hartmann, J. CHARR AS INDICATORS OF POLLUTION. *Fisheries (Bull. Am. Fish. Soc.)* 8(6):10-12. Nov.-Dec. 1983. SFA 29(1)
[Lake Res. Fish., Langenargen, West Germany]

84-000606 Hilton, J. W.; P. V. Hodson; H. E. Braun; J. L. Leatherland and S. J. Slinger. CONTAMINANT ACCUMULATION AND PHYSIOLOGICAL RESPONSE IN RAINBOW TROUT (*SALMO GAIARDNERI*) REARED ON NATURALLY CONTAMINATED DIETS. *Can. J. Fish. Aquatic Sci.* 40(11):1987-1994. Nov. 1983. In English with French summ. SFA 29(1)
[Dep. Nutr., Group Advancement Fish Stud., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

84-000607 Huckins, J. N. and J. D. Petty. DYNAMICS OF PURIFIED AND INDUSTRIAL PENTACHLOROPHENOL IN FATHEAD MINNOWS. *Arch. Environ. Contam. Toxicol.* 12(6):667-672. Nov. 1983. SFA 29(1)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Rt. 1, Columbia, MO 65201]

84-000608 Hunter, R. G. and J. H. Carroll. CHLOROPHENOXY HERBICIDE RESIDUES IN FISHES AND SEDIMENTS OF LAKE TEXOMA. *Proc. Okla. Acad. Sci.* 62:34-37. 1982. SFA 29(1)
[Environ. Anal. Sect., Corps Eng., P.O. Box 61, Tulsa, OK 74121]

84-000609 Jenkins, S. H. and P. S. Hansen, (eds.). COOLING WATER DISCHARGES FROM COAL FIRED POWER PLANTS: WATER POLLUTION PROBLEMS. *Water Sci. Technol.* 15(10):viii + 266p. 1983. A collection of papers.---RS. SFA 29(1)
[Water Quality Inst., Denmark]

SPORT FISHERY ABSTRACTS

POLLUTION (CONTINUED)

84-000610 Johnson, L. ASSESSMENT OF THE EFFECTS OF OIL ON ARCTIC MARINE FISH AND MARINE MAMMALS. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1200. viii + 15p. Nov. 1983. In English with French summ. SFA 29(1)
[Dep. Fish. Oceans, 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

84-000611 Kanciruk, P.; J. E. Breck and D. S. Vaughan. POPULATION-LEVEL EFFECTS OF MULTIPLE STRESSES ON FISH AND SHELLFISH. *Oak Ridge Natl. Lab. Environ. Sci. Div. Publ.* No. 1967. 124p. Nov. 1982. From U.S. Government Reports 83(14):3079. 8 July 1983. Available from NTIS as DE83004235. SFA 29(1)

84-000612 Kumagai, H. and K. Saeki. [HEAVY METAL CONTENTS OF WILD AND CULTURED PUFFERS *FUGU RUBRIPES*. *Bull. Jpn. Soc. Sci. Fish.* 49(8):1253-1256. Aug. 1983. In Japanese with English summ. SFA 29(1)
[Yamaguchi Pref. Res. Inst. Health, Aoi, Yamaguchi 753, Japan]

84-000613 Leggett, H. G.; E. J. Watkins, G. F. Pessoney and R. T. van Aller. OFF-FLAVOR IN CHANNEL CATFISH (*ICTALURUS PUNCTATUS*): IMPLICATIONS ON BLUE-GREEN ALGAE. *Am. Zool.* 23(4):887. 1983. Abstract only. SFA 29(1)
[Univ. South. Miss., Hattiesburg]

84-000614 Martin, M. G. and J. J. Ney. SOURCES OF VARIABILITY IN THE ACCUMULATION OF HEAVY METALS BY BLUEGILL SUNFISH AND CHANNEL CATFISH IN A VIRGINIA RESERVOIR. *Va. J. Sci.* 34(3):127. 1983. Abstract only. SFA 29(1)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061]

84-000615 McKenzie, D. H.; M. A. Simmons and J. R. Skalski. APPLICATION OF FISHERIES MANAGEMENT TECHNIQUES TO ASSESSING IMPACTS. *Battelle Pac. Northwest Lab.* PNL-4313. 56p. Jan. 1983. From U.S. Government Reports 83(13):2901. 24 June 1983. Available from NTIS as NUREG/CR-2804. SFA 29(1)

84-000616 Nero, R. W. and D. W. Schindler. DECLINE OF *MYSIS RELICTA* DURING THE ACIDIFICATION OF LAKE 223. *Can. J. Fish. Aquatic Sci.* 40(11):1905-1911. Nov. 1983. In English with French summ. SFA 29(1)
[Dep. Zool., Univ. Toronto, Erindale Campus, Mississauga, ON L5L 1C6, Canada]

84-000617 Ney, J. J. and J. H. Van Hassel. SOURCES OF VARIABILITY IN ACCUMULATION OF HEAVY METALS BY FISHES IN A ROADSIDE STREAM. *Arch. Environ. Contam. Toxicol.* 12(6):701-706. Nov. 1983. SFA 29(1)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061] Interspecific variations in lead, nickel, cadmium, and zinc concentrations among six species of fish from a highway-contaminated stream were investigated as functions of differences in habitat (sediment contact) and morphology (percentage axial muscle). Association with stream sediment appeared to influence whole-body metals accumulation but percentage muscle did not. Intraspecific variation in whole-body metal concentrations was not positively related to length (as an index of duration of exposure) in any species. However, lead and nickel content of bone and cadmium content of kidney increased consistently between ages 2 and 5 in white sucker, the only species subjected to tissue analysis across age groups. These findings suggest that biological monitoring to assess chronic heavy metal pollution should focus on

POLLUTION (CONTINUED)

84-000617 CONTINUED long-lived benthic species and be directed at tissues with demonstrated affinities for particular metals.

84-000618 Niimi, A. J. and C. Y. Cho. LABORATORY AND FIELD ANALYSIS OF PENTACHLOROPHENOL (PCP) ACCUMULATION BY SALMONIDS. *Water Res.* 17(12):1791-1795. 1983. SFA 29(1)

[Can. Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

84-000619 Pearce, J. B., (ed.). REVIEW OF WATER QUALITY AND TRANSPORT OF MATERIALS IN COASTAL AND ESTUARINE WATERS. *Int. Counc. Explor. Sea. Coop. Res. Rep. No. 118.* 216p. Feb. 1983. SFA 29(1)

[Int. Counc. Explor. Sea., Palaegade 2-4, D-K 1261 Copenhagen K, Denmark]

84-000620 Peterson, R. H. and H. H. V. Hord (eds.). 1983 WORKSHOP ON ACID RAIN. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1213. v + 79p. Sept. 1983. In English with French summ. SFA 29(1)

[Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

84-000621 Peterson, S. LAKE ONTARIO'S FISH--HOW THEY ALMOST GOT AWAY. *Environment* 25(9):25-32. Nov. 1983. SFA 29(1)

84-000622 Rudd, J. W. M.; M. A. Turner; A. Furutani; A. L. Swick and B. E. Townsend. THE ENGLISH-WABIGOON RIVER SYSTEM: I. A SYNTHESIS OF RECENT RESEARCH WITH A VIEW TOWARDS MERCURY AMELIORATION. *Can. J. Fish. Aquatic Sci.* 40(12):2206-2217. Dec. 1983. In English with French summ. SFA 29(1)

[Dep. Fish. Oceans, 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

84-000623 Schreiber, W. MERCURY CONTENT OF FISHERY PRODUCTS: DATA FROM THE LAST DECADE. *Sci. Total Environ.* 31(3):283-300. 1 Dec. 1983. SFA 29(1)

[Inst. Biochem. Technol., Bundesforsch. Fisch., D-2000 Hamburg 50, Palmaille 9, West Germany]

84-000624 Starnes, L. B. EFFECTS OF SURFACE MINING ON AQUATIC RESOURCES IN NORTH AMERICA. *Fisheries (Bull. Am. Fish. Soc.)* 8(6):2-4. Nov.-Dec. 1983. SFA 29(1)

84-000625 Subramanian, B. R.; S. Tanabe; H. Hidaka and R. Tatsukawa. DDTs AND PCB ISOMERS AND CONGENERS IN ANTARCTIC FISH. *Arch. Environ. Contam. Toxicol.* 12(6):621-626. Nov. 1983. SFA 29(1)

[Ehime Univ., Dep. Environ. Conserv., Tarumi 3-Chome, Matsuyama 790, Japan]

84-000626 Topping, G. GUIDELINES FOR THE USE OF BIOLOGICAL MATERIAL IN FIRST ORDER POLLUTION ASSESSMENT AND TREND MONITORING. *Scott. Fish. Res. Rep. No. 28.* 28p. 1983. SFA 29(1)

[Mar. Lab., Aberdeen, Scotland]

SPORT FISHERY ABSTRACTS

POLLUTION (CONTINUED)

84-000627 Turner, M. A. and A. L. Swick. THE ENGLISH-WABIGOON RIVER SYSTEM: IV. INTERACTION BETWEEN MERCURY AND SELENIUM ACCUMULATED FROM WATERBORNE AND DIETARY SOURCES BY NORTHERN PIKE (*ESOX LUCIUS*). *Can. J. Fish. Aquatic Sci.* 40(12):2241-2250. Dec. 1983. In English with French summ. SFA 29(1)

[Freshwater Inst., 501 University Crescent, Winnipeg, MB R3T 2N6, Canada]

84-000628 Vaughan, D. S.; P. Kanciruk and J. E. Breck. RESEARCH NEEDS TO ASSESS POPULATION-LEVEL EFFECTS OF MULTIPLE STRESSES ON FISH AND SHELLFISH. *Oak Ridge Natl. Lab. Environ. Sci. Div. Publ. No.* 1995. 36p. Nov. 1982. From U.S. Government Reports 83(14):3078. 8 July 1983. Available from NTIS as DE83003386. SFA 29(1)

84-000629 Watanabe, I.; T. Kashimoto and R. Tatsukawa. POLYBROMINATED ANISOLES IN MARINE FISH, SHELLFISH, AND SEDIMENTS IN JAPAN. *Arch. Environ. Contam. Toxicol.* 12(6):615-620. Nov. 1983. SFA 29(1)

[Osaka Pref. Inst. Publ. Health, 3-69, 1-Chome, Nakamichi, Higashinari-ku, Osaka 537, Japan]

FISH KILLS

84-000630 Haslouer, S. G. NATURAL AND POLLUTION CAUSED FISH KILLS IN KANSAS DURING 1979-1980. *Trans. Kans. Acad. Sci.* 86:136-143. 1983. SFA 29(1)

[Div. Environ., Kans. Dep. Health Environ., Topeka 66620] Fifty-one fish kills were reported to the Kansas Department of Health and Environment for the 2 year period 1979-1980. Two-thirds of these (34) were pollution caused. The remaining seventeen incidents were caused by natural processes. Natural mortalities led other categories in number of reports (33 percent of total) and number of fish killed (67 percent). Where pollution was involved and the cause was determined, transportation operations were responsible for both the most reports (eleven) and the greatest number of fish killed (55,432). Agriculture followed, claiming seven reports and 22,175 fish. Municipal operations killed 4170 fish in five incidents. Three reports were associated with industrial operations, killing 16,000 fish. Eight fish kills in the "Other" and "Undetermined" categories were responsible for killing 3 percent of the fish (8,931). Twenty incidents killed over 1000 fish each, five of these killed more than 10,000 fish each and one fish kill claimed over 100,000 fish.

84-000631 Holt, S. A. and G. J. Holt. COLD DEATH OF FISHES AT PORT ARANSAS, TEXAS: JANUARY 1982. *Southwest Nat.* 28(4):464-466. 9 Dec. 1983. SFA 29(1)

[Univ. Tex. Mar. Sci. Inst., Port Aransas Mar. Lab., Port Aransas 78373]

TOXICOLOGY; BIOASSAYS

84-000632 Angus, R. A. PHENOL TOLERANCE IN POPULATIONS OF MOSQUITOFISH FROM POLLUTED AND NONPOLLUTED WATERS. *Trans. Am. Fish. Soc.* 112(6):794-799. Nov. 1983. SFA 29(1)

[Dep. Biol., Univ. Ala., Birmingham 35294]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000633 Bakthavathsalam, R. and Y. S. Reddy. INTOXICATION EFFECTS OF LINDANE (γ -BHC) ON THE CARBOHYDRATE METABOLISM IN THE CLIMBING PERCH, *ANABAS TESTUDINEUS* (BLOCH). *Pestic. Biochem. Physiol.* 20(3):340-346. Dec. 1983. SFA 29(1)

[Dep. Zool., Arignar Anna Gov. Arts Coll., Musiri - 621 201, Tamil Nadu, India] The effects of an acute lethal (0.59 mg/liter) and a sublethal (0.075 mg/liter) concentration of lindane on the levels of glycogen (liver and muscle), glucose (blood), and lactic acid (liver, muscle, and blood) of a freshwater fish, *Anabas testudineus* (Bloch) were determined. A marked decrease in the liver glycogen and significant increase in blood glucose and muscle glycogen at 1 hr of exposure of 0.075 mg/liter lindane was noted. These results indicate extensive utilization of energy stores in the liver and simultaneous buildup of fuel reserves in the muscle. After 3 hr of exposure, glycogenesis possibly becomes operative in liver through the Cori cycle. The activity of the cycle was observed in the fish in all the subsequent periods of exposure studied. At 120 hr, the decreases observed in muscle and liver glycogen indicate near exhaustion of glycogen stores. Though changes in glycogen content of both muscle and liver were similar in 0.59 mg/liter lindane, they have less adaptive value since mortality of fish was significantly high at all three periods studied.

84-000634 Biddinger, G. R. EFFECTS OF SODIUM ARSENITE ON THE GROWTH, DEVELOPMENT AND REPRODUCTION OF THE JAPANESE MEDAKA, *ORYZIAS LATIPES*. Ph.D. dissertation, Indiana State Univ. 71p. 1981. From Diss. Abstr. Int. B Sci. Eng. 44(6):1744. Dec. 1983. SFA 29(1)

84-000635 Birge, W. J.; W. H. Benson and J. A. Black. THE INDUCTION OF TOLERANCE TO HEAVY METALS IN NATURAL AND LABORATORY POPULATIONS OF FISH. *Univ. Ky. Water Resour. Res. Inst. Res. Rep. No. 141. vi + 26p.* June 1983. SFA 29(1)

[Water Resour. Inst., Univ. Ky., Lexington]

84-000636 Boudou, A. and F. Ribeyre. INFLUENCE DE LA DUREE D'EXPOSITION SUR LA BIOACCUMULATION PAR VOIE DIRECTE DE DEUX DERIVES DU MERCURE PAR *SALMO GAIARDNERI* (ALEVINS) ET RELATION "POIDS DES ORGANISMES-CONCENTRATION EN MERCURE." [INFLUENCE OF EXPOSURE LENGTH ON THE DIRECT BIOACCUMULATION OF TWO MERCURY COMPOUNDS BY *SALMO GAIARDNERI* (FRY) AND THE RELATIONSHIP BETWEEN ORGANISM WEIGHT AND MERCURY CONCENTRATIONS.] *Water Res.* 18(1):81-86. 1984. In French with English summ. SFA 29(1)

[Lab. Ecol. Anim., Univ. Bordeaux I, Fac. Sci., 40 rue Lamartine, 33400 Talence, France]

84-000637 Brooks, A. S.; J. M. Bartos and P. T. Danos. EFFECTS OF CHLORINE ON FRESHWATER FISH UNDER VARIOUS TIME AND CHEMICAL CONDITIONS: TOXICITY OF CHLORINE TO FRESHWATER FISH. FINAL REPORT. *Univ. Wis. Cent. Great Lakes Stud.* 61p. July 1982. From U.S. Government Reports 83(6):990. 18 Mar. 1983. Available from NTIS as DE82905841. SFA 29(1)

Laboratory bioassays to determine the acute toxicity of monochloramine, dichloramine, hypochlorous acid, and hypochlorite ion to emerald shiners, channel catfish, and rainbow trout were conducted. Four exposure regimes typical of chlorination schedules at operating steam electric power plants were used. Fish were exposed to single 15-minute, 30-minute, 120-minute, and quadruple 30-minute periods. No mortality or LC50 values were determined for each species of fish and chemical species of chlorine. Hypochlorous acid was the most toxic form of chlorine studied, followed closely by dichloramine. Monochloramine and hypochlorite ion were three to four times less toxic than hypochlorous acid and dichloramine. On the average, emerald shiners were 1.8

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000637 CONTINUED times more sensitive to chlorine than channel catfish and 3.3 times more sensitive than rainbow trout to the four forms of chlorine. The fish were more tolerant of chlorine during short duration exposures and most sensitive during the continuous 120-minute exposures. The significant differences in toxicity noted among the various chlorine species suggest that careful attention should be paid not only to total residual chlorine but to both the chlorine and fish species present and the duration of exposure expected in establishing chlorination regimes.

84-000638 Buckley, J. A. COMPLEXATION OF COPPER IN THE EFFLUENT OF A SEWAGE TREATMENT PLANT AND AN ESTIMATE OF ITS INFLUENCE ON TOXICITY TO COHO SALMON. *Water Res.* 17(12):1929-1934. 1983. SFA 29(1)

[Metro Water Quality Lab., 410 West Harrison St., Seattle, WA 98119]

84-000639 Burke, P. M. SOME EFFECTS OF CRUDE AND NO. 2 FUEL OIL ON THE CHROMOSOMES OF THE SMOOTH FLOUNDER, *LIOPSETTA PUTNAMI* (GILL). *Ph.D. dissertation, Univ. N. H.* 167p. 1982. From Diss. Abstr. Int. B Sci. Eng. 44(5):1375. Nov. 1983. SFA 29(1)

84-000640 Burton, D. T.; L. W. Hall, Jr., R. J. Klauda and S. L. Margrey. EFFECTS OF TREATED BLEACHED KRAFT MILL EFFLUENT ON EGGS AND PROLARVAE OF STRIPED BASS (*MORONE SAXATILIS*). *Water Resour. Bull.* 19(6):869-879. Dec. 1983. SFA 29(1)

[Appl. Phys. Lab., Aquatic Ecol. Sect., Johns Hopkins Univ., Shadey Side, MD 20764] Striped bass (*Morone saxatilis*) eggs and prolarvae were exposed to a range of treated bleached kraft mill effluent (BKME) concentrations from 0 to 20 percent effluent by volume (v/v) under continuous flow test conditions. The treated BKME used in the study before dilution had a BOD₅ of 18 to 25mg/l, TSS of 60 to 185 mg/l and true color of 1750 to 1755 mg/l. No mortality attributable to BKME was found in three separate egg studies. No delayed hatching of the eggs occurred in any of the BKME treatments relative to the control treatment. No significant morphological abnormalities (pugheadness, truncation, or scoliosis) were found in prolarvae exposed to BKME from the egg stage through six days post/hatch. Tests with prolarvae revealed that BKME at concentrations from 2 to 20 percent v/v did not cause mortality during exposures up to 60 hours. However, BKME concentrations ranging between 8 to 12 percent up to 20 percent v/v caused increased mortality after 72 hours of exposure.

84-000641 Cenini, P. and R. J. Turner. *IN VITRO* EFFECTS OF ZINC ON LYMPHOID CELLS OF THE CARP, *CYPRINUS CARPIO* L. *J. Fish Biol.* 23(5):579-583. Nov. 1983. SFA 29(1)

[Dep. Zool., Univ. Coll. Wales, Aberystwyth SY23 3DA, Wales]

84-000642 Collvin, L. THE EFFECTS OF COPPER ON MAXIMUM RESPIRATION RATE AND GROWTH RATE OF PERCH, *PERCA FLUVIATILIS* L. *Water Res.* 18(2):139-144. 1984. SFA 29(1)

[Inst. Limnol., Univ. Lund, Box 3060, S-220 03 Lund, Sweden] Addition of copper to the ambient water of perch resulted in decreased daily maximum respiration rates (R_{max}) and growth rates. The time-course of the effect in R_{max} was characterized by: (1) and initial decrease over three additions; (2) a minimal "trough" lasting some 10-15 days; and (3) a phase of increasing R_{max}. The variation in R_{max} was due to copper concentration and exposure time. The decrease in growth rate was most dramatic initially and was correlated to copper concentration and perch weight. The subsequent increase in growth rate was constant and independent of copper concentration.

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000642 CONTINUED The increase in R_{max} and in growth rate was interpreted as acclimatization. Up to a given sublethal copper concentration acclimatization resulted in a return to the control level of R_{max} but not of growth rate.

84-000643 Da Costa, H. and S. M. Ruby. THE EFFECT OF SUBLETHAL CYANIDE ON VITELLOGENIC PARAMETERS IN RAINBOW TROUT *SALMO GAIKDNERI*. Arch. Environ. Contam. Toxicol. 13(1):101-104. Jan. 1984. SFA 29(1)

[Dep. Biol. Sci., Water Pollut. Res. Lab., Concordia Univ., Montreal PQ H3G 1M8, Canada] The effects of sublethal cyanide exposure on exogenous yolk production by the liver was examined in sexually maturing female rainbow trout *Salmo gairdneri* at the onset of vitellogenesis. Fish were exposed to a range of sublethal concentrations of cyanide (0.01, 0.02 and 0.03 mg/L) for 7 days at $12.5 \pm 1^\circ\text{C}$. Serum calcium and phosphoprotein phosphorus levels were measured and hepatosomatic indices calculated as indicators of exogenous yolk production. Results indicate that serum calcium levels were significantly reduced at 0.01 mg/L HCN in males and females. There was no apparent effect upon serum phosphoprotein phosphorus levels or hepatosomatic indices at this concentration. Serum calcium levels in females were significantly reduced when compared with control females and hepatosomatic indices declined at 0.02 mg/L HCN. The implication of reduced serum calcium during early vitellogenesis upon secondary yolk production and reproduction in females is discussed.

84-000644 Doane, T. R.; A. L. Buikema, Jr. and J. Cairns, Jr. SUBLETHAL EFFECTS OF THE WATER SOLUBLE FRACTION OF JP-4 JET FUEL ON THE BLUEGILL (*LEPOMIS MACROCHIRUS*). Va. J. Sci. 34(3):120. 1983. Abstract only. SFA 29(1)

[Univ. Cent. Environ. Sci., VPI & SU, Blacksburg, VA 24061]

84-000645 Drewett, N. and P. D. Abel. PATHOLOGY OF LINDANE POISONING AND OF HYPOXIA IN THE BROWN TROUT, *SALMO TRUTTA* L. J. Fish Biol. 23(4):373-384. Oct. 1983. SFA 29(1)

[Northumbrian Water Auth., Reg. Biol. Lab., Northumberland Yard, East Hawdon, Wallsend, Tyne & Wear, U.K.] A comparative study of the signs of lindane poisoning and of hypoxia in trout, *Salmo trutta* L., showed that the symptoms of both causes of death are similar. The rapid fading of gill colour within 2 h of death is characteristic of both treatments and distinguishes these from other causes of death. Vascular congestion and cellular damage of the liver is common to both treatments. The causes of death may be distinguished by the behaviour of the fish before death and by study of their effects on the gills. Hypoxic fish showed increased ventilatory activity, but other activity decreased. Exposure to lethal levels of lindane caused hyperactivity, convulsions, ataxia and intermittent paralysis. Although gill damage in both cases was slight it was distinctive. Lindane caused disarray of the secondary lamellae, and exposure to low dissolved oxygen levels caused breaks in the lamellar epithelium. This was only clearly visible under electron microscopical examination.

84-000646 Fajer, E. TOLERANCIA DE LOS JUVENILES DE LA CARPA INDIA (*LABEO ROHITA*) A LA SAL COMÚN Y AL PERMANGANATO DE POTASIO. [TOLERANCE OF JUVENILE INDIAN CARP (*LABEO ROHITA*) TO COMMON SALT AND POTASSIUM PERMANGANATE.] Rev. Cubana Invest. Pesq. 5(1):28-37. 1980. In Spanish with English summ. SFA 29(1)

[Empresa Nac. Acuicult., Cuba]

TOXICOLOGY; BIOASSAYS (CONTINUED)

- 84-000647 Friese, U. E. A PRELIMINARY INVESTIGATION INTO THE TOXICITY OF 'SWOSH'--AN ALKALINE CLEANSER AND OIL DISPERSANT--ON FISHES. *J. Fac. Mar. Sci. (Jeddah)* 3:81-84. 1983. In English with Arabic summ. SFA 29(1)
[Fac. Mar. Sci., King Abdulaziz Univ., Jeddah, Saudi Arabia]
- 84-000648 Genevois, J. P.; A. Autefage; P. Fayolle; A. Cazieux and P. Bonnemaison. L'ANESTHESIE DES ESPÈCES INSOLITES EN PRATIQUE VÉTÉRINAIRE COURANTE. NOTE 1: L'ANESTHESIE DES POISSONS ET DES REPTILES. [ANAESTHESIA OF UNUSUAL SPECIES OF COMMON VETERINARY PRACTICE. NOTE 1. FISHES AND REPTILES ANESTHESIA.] *Rev. Med. Vet.* 134(8-9):471-479. 1983. In French with Spanish, German and English summ. SFA 29(1)
[Mal. Contag. Zoonoses, Ecole Natl. Vet. Toulouse, 23, Chemin de Capelles, F-31076 Toulouse Cedex, France]
- 84-000649 Gibson, C. I.; F. C. Tone; R. E. Schirmer and J. W. Blaylock. BIOACCUMULATION AND DEPURATION OF BROMOFORM IN FIVE MARINE SPECIES. *Battelle Pac. Northwest Lab. CONF-7910138-4*. 22p. Sept. 1979. From U.S. Government Reports 83(13):2833. 24 June 1983. Available from NTIS as PNL-SA-7857. SFA 29(1)
- 84-000650 Harader, R. R., Jr. and G. H. Allen. AMMONIA TOXICITY TO CHINOOK SALMON PARR: REDUCTION IN SALINE WATER. *Trans. Am. Fish. Soc.* 112(6):834-837. Nov. 1983. SFA 29(1)
[Fish. Dep., Coll. Nat. Resour., Humboldt State Univ., Arcata, CA 95521]
- 84-000651 Harder, H. W.; T. V. Carter and T. F. Bidleman. ACUTE EFFECTS OF TOXAPHENE AND ITS SEDIMENT-DEGRADED PRODUCTS ON ESTUARINE FISH. *Can. J. Fish. Aquatic Sci.* 40(12):2119-2125. Dec. 1983. In English with French summ. SFA 29(1)
[Mar. Sci. Prog., Belle W. Baruch Inst. Mar. Biol. Coastal Res., Univ. S. C., Columbia 29208]
- 84-000652 Harrison, F. L. A REVIEW OF THE IMPACT OF COPPER RELEASED INTO MARINE AND ESTUARINE ENVIRONMENTS. *Lawrence Livermore Natl. Lab.* 128p. Nov. 1982. From U.S. Government Reports 83(6):990. 18 Mar. 1983. Available from NTIS as NUREG/CR-2823. SFA 29(1)
- 84-000653 Hayton, W. L. and G. R. Stehly. pH CONTROL OF WEAK ELECTROLYTE TOXICITY TO FISH. *Environ. Toxicol. Chem.* 2(3):325-328. 1983. SFA 29(1)
[Coll. Pharm., Wash. State Univ., Pullman 99164-6510] A pharmacokinetic model was used to predict the acute toxicity of weak electrolytes to fish as a function of pH. For weak acids, the model predicted that the toxic concentration-pH profile was shifted to the right of the ionized fraction-pH profile. The relative rates of uptake of ionized and nonionized species can be calculated using toxic concentration-pH data.
- 84-000654 Hilmy, A. M.; H. K. Badawi and M. B. Shabana. ORGANOCHLORINE PESTICIDE RESIDUES IN 12 FRESHWATER EGYPTIAN FISH SPECIES WITH SPECIAL EMPHASIS ON *ANGUILLA VULGARIS* AND *MUGIL CEPHALUS*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(1):163-171. 1983. SFA 29(1)
[Dep. Zool., Fac. Sci., Alexandria Univ., Egypt]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000655 Hilmy, A. M.; H. K. Badawi and M. B. Shabana. PHYSIOLOGICAL MECHANISM OF TOXIC ACTION OF DDT AND ENDRIN IN TWO EURYHALINE FRESHWATER FISHES, *ANGUILLA VULGARIS* AND *MUGIL CEPHALUS*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(1):173-179. 1983. SFA 29(1)
[Dep. Zool., Fac. Sci., Alexandria Univ., Egypt]

84-000656 Hokama, Y.; M. A. Abad and L. H. Kimura. A RAPID ENZYME-IMMUNOASSAY FOR THE DETECTION OF CIGUATOXIN IN CONTAMINATED FISH TISSUES. *Toxicol* 21(6):817-824. 1983. SFA 29(1)
[John A. Burns Sch. Med., Dep. Pathol., Univ. Hawaii, Honolulu 96822]

84-000657 Ingebrigtsen, K. and J. U. Skaare. DISTRIBUTION AND ELIMINATION OF [^{14} C]HEXACHLOROBENZENE AFTER SINGLE ORAL EXPOSURE IN THE RAINBOW TROUT (*SALMO GAIIRDNERI*). *J. Toxicol. Environ. Health* 12(2-3):309-316. Aug.-Sept. 1983. SFA 29(1)
[Dep. Pharmacol. Toxicol., Norwegian Coll. Vet. Med., Oslo, Norway]

84-000658 Jensen, R. and J. Knudsen. ACTIVITY AND INDUCIBILITY OF ARYL HYDROCARBON HYDROXYLASE IN THE EELPOUT *ZOARCES VIVIPARUS* (L.). *Arch. Environ. Contam. Toxicol.* 12(6):673-678. Nov. 1983. SFA 29(1)
[J. Knudsen: Inst. Biochem., Odense Univ., DK-5230 Odense M, Denmark]

84-000659 Kehoe, D. M. THE EFFECTS OF GRAYS HARBOR ESTUARY SEDIMENT ON THE OSMOREGULATORY ABILITY OF COHO SALMON SMOLTS, *ONCORHYNCHUS KISUTCH*. *U.S. Army Corps Eng. Seattle Dist.* 30p. Sept. 1982. From U.S. Government Reports 83(8):1474. 15 Apr. 1983. Available from NTIS as AD-A 122 206/6. SFA 29(1)
Flow through bioassays were performed on smolting juvenile coho salmon with sediment from inner areas of Grays Harbor estuary. Previous work has shown that heavy metals have the ability to impair osmoregulatory capacity. Fish were exposed to these sediments for 9 days and then placed in seawater for 24 hours. Dredging activities occurring in the inner portion of Grays Harbor are not believed to be causing impairment of migrating smolts.

84-000660 Kiessling, A.; P. Pärt; O. Ring and K. Lindahl-Kiessling. EFFECTS OF PCB ON THE ADRENERGIC RESPONSE IN PERFUSED GILLS AND ON LEVELS OF MUSCLE GLYCOGEN IN RAINBOW TROUT (*SALMO GAIIRDNERI* RICH.). *Bull. Environ. Contam. Toxicol.* 31(6):712-718. Dec. 1983. SFA 29(1)
[Inst. Zoophysiol., Univ. Uppsala, Sweden]

84-000661 Kumaraguru, A. K. EFFECTS OF PERMETHRIN (NRDC-143) ON THE BIOENERGETICS OF RAINBOW TROUT, *SALMO GAIIRDNERI* RICHARDSON. *Ph.D. dissertation, Univ. Guelph (Canada)* 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1690. Dec. 1983. SFA 29(1)

84-000662 Limsuwan, C.; T. Limsuwan; J. M. Grizzle and J. A. Plumb. STRESS RESPONSE AND BLOOD CHARACTERISTICS OF CHANNEL CATFISH (*ICTALURUS PUNCTATUS*) AFTER ANESTHESIA WITH ETOMIDATE. *Can. J. Fish. Aquatic Sci.* 40(12):2105-2112. Dec. 1983. In English with French summ. SFA 29(1)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000663 Menezes, M. R. and S. Z. Qasim. EFFECTS OF MERCURY ACCUMULATION ON THE ELECTROPHORETIC PATTERNS OF THE SERUM, HAEMOGLOBIN AND EYE LENS PROTEINS OF *TILAPIA MOSSAMBICA* (PETERS). *Waters Res.* 18(2):153-161. 1984. SFA 29(1)

[Natl. Inst. Oceanogr., Dona Paula, Goa-403004, India]

84-000664 Meyer, F. P. and T. A. Jorgenson. TERATOLOGICAL AND OTHER EFFECTS OF MALACHITE GREEN ON DEVELOPMENT OF RAINBOW TROUT AND RABBITS. *Trans. Am. Fish. Soc.* 112(6):818-824. Nov. 1983. SFA 29(1)

[U.S. FWS, Natl. Fish. Res. Lab., La Crosse, WI 54601]

84-000665 Meyers, T. R. and J. D. Hendricks. A SUMMARY OF TISSUE LESIONS IN AQUATIC ANIMALS INDUCED BY CONTROLLED EXPOSURES TO ENVIRONMENTAL CONTAMINANTS, CHEMOTHERAPEUTIC AGENTS, AND POTENTIAL CARCINOGENS. *Mar. Fish Rev.* 44(12):1-17. Dec. 1982. SFA 29(1)

[Sch. Fish. Sci., Univ. Alaska, 11120 Glacier Highway, Juneau, AK 99801]

84-000666 Muramoto, S. INFLUENCE OF COMPLEXANS (NTA, EDTA) ON THE TOXICITY OF NICKEL CHLORIDE AND SULFATE TO FISH AT HIGH CONCENTRATIONS. *J. Environ. Sci. Health A Environ. Sci. Eng. (Marcel Dekker, Inc., N. Y.)* 18(6):787-795. 1983. SFA 29(1)

[Inst. Agric. Biol. Sci., Okayama Univ., Kurashiki, 710 Japan] The effect of complexans (NTA, EDTA) on the toxicity of nickel chloride and sulfate to carp (*Cyprinus carpio* L.), and on the accumulation of metals in fish at lethal level concentrations was studied. The toxicity of nickel salts to carp was relatively lower, and nickel chloride was more toxic than nickel sulfate. The concentration of metals in fish exposed to nickel chloride and sulfate was remarkably lower than those in the fish exposed to some other heavy metals, such as Cd, Pb, Zn, Cr and Al which were reported in the previous papers. The inhibition of metal accumulation by the presence of complexans was recognized in each part of the fish, but no significant decrease of mortality of fish to the toxicity of nickel salts.

84-000667 Newcomb, T. W. and T. A. Flagg. SOME EFFECTS OF MT. ST. HELENS VOLCANIC ASH ON JUVENILE SALMON SMOLTS. *Mar. Fish. Rev.* 45(2):8-12. Feb. 1983. SFA 29(1)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] Chinook, *Oncorhynchus tshawytscha*, and sockeye, *O. nerka*, salmon smolts were exposed to various concentrations of airborne volcanic ash from the 18 May 1980 eruption of Washington's Mt. St. Helens. These bioassays were conducted at Bonneville Dam on the lower Comumbia River between 7 and 27 June 1980. In static bioassays, 25 percent (v/v) ash caused 100 percent mortality in 1 hour, whereas 10 percent (v/v) ash caused 60 percent mortality in 6 hours. No mortality was noted at concentrations of 5 percent (v/v) or less airborne ash over 24 hours. In dynamic bioassays with continuous resuspension of ash, $LC_{10} = 0.5g/l$, $LC_{50} = 6.1g/l$, and $LC_{90} = 34.9g/l$ at 36 hours (at 15-17°C; oxygen near saturation). The gills of dead juvenile chinook and sockeye salmon smolts were uniformly coated with mucus and volcanic ash; no gross evidence of abrasion or hemorrhage was seen. Impaired oxygen exchange is suggested as the primary cause of death.

84-000668 Nieminen, M.; P. Pasanen and M. Laitinen. EFFECTS OF FORMALIN TREATMENT ON THE BLOOD COMPOSITION OF SALMON (*SALMO SALAR*) AND RAINBOW TROUT (*SALMO GAIARDNERI*). *Comp. Biochem. Physiol. C Comp. Pharmacol.*

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000668 CONTINUED *Toxicol.* 76(2):265-269. 1983. SFA 29(1)
[Finnish Game Fish. Res. Inst., Game Div., 96100 Rovaniemi 10, Finland]

84-000669 Ozretich, R. J.; R. C. Randall; B. L. Boese; W. P. Schroeder and J. R. Smith. ACUTE TOXICITY OF BUTYLBENZYL PHTHALATE TO SHINER PERCH (*CYMATOGASTER AGGREGATA*). *Arch. Environ. Contam. Toxicol.* 12(6):655-660. Nov. 1983. SFA 29(1)

[U.S. EPA, Corvallis Environ. Res. Lab., Mar. Div., Mar. Sci. Cent., Newport, OR 97365] The Clean Water Act of 1971 directed the Environmental Protection Agency to establish ambient water quality criteria for several classes of elements and compounds, including phthalate esters. Multispecies acute toxicity data are required to develop these criteria. Static bioassay LC_{50} s for butylbenzyl phthalate (BBP) for a single species of marine fish based on nominal doses range from 3 mg/L to 440 mg/L. Flow-through bioassays were used in this study of BBP with shiner perch (*Cymatogaster aggregata*). Using measured exposure concentrations, 96-hr LC_{50} s averaged 0.51 mg/L. Effects on schooling behavior were found at 0.08 mg/L and coloration at 0.24 mg/L. Coupled with the behavioral changes, reduced brain levels of epinephrine found in surviving fish indicated that the mode of acute toxicity for BBP may be through its effects on the catecholamines of the central adrenergic nervous system.

84-000670 Pant, J. C. and T. Singh. INDUCEMENT OF METABOLIC DYSFUNCTION BY CARBAMATE AND ORGANOPHOSPHORUS COMPOUNDS IN A FISH, *PUNTIOUS CONCHONIUS*. *Pestic. Biochem. Physiol.* 20(3):294-298. Dec. 1983. SFA 29(1)

[Dep. Zool., Th. D.S.B. Coll., Kumaun Univ., Naini Tal 263 002, India] Exposure of a freshwater cyprinid (*Puntius conchoni*) to 2.142 and 4.784 ppm of carbaryl and dimethoate, respectively, for 24 hr, seriously affected carbohydrate and cholesterol metabolism. Significant hyperglycemia and glycogenolysis in liver, brain, and heart were manifested in the treated fish. Hypercholesterolemia and rise in liver cholesterol also occurred. Long-term exposure, 15-30 days, to chronically sublethal concentrations, 0.194 and 0.306 ppm carbaryl and 0.434 and 0.683 ppm dimethoate, elicited hypoglycemia and depletion of liver glycogen, together with enhanced glycogenesis in the heart. The glycogen level in brain fell in response to carbaryl exposure in contrast to a significant elevation caused by dimethoate. Reduction in blood and liver cholesterol at 15 days was followed by an increase at 30 days.

84-000671 Peer, M. M.; J. Nirmala and M. N. Kutty. EFFECTS OF PENTACHLOROPHENOL (Na PCP) ON SURVIVAL, ACTIVITY AND METABOLISM IN *RHINOMUGIL CORSULA* (HAMILTON), *CYPRINUS CARPIO* (LINNAEUS) AND *TILAPIA MOSSAMIBICA* (PETERS). *Hydrobiologia* 107(1):19-24. 21 Oct. 1983. SFA 29(1)

[Cent. Inland Fish. Res. Sub Stn., 24 Pannalal Rd., Allahabad 211 002 (U.P.), India] The median lethal time (LT_{50}) at any one initial nominal concentration of PCP tested ($1.0-4.0 \text{ mg} \cdot \text{l}^{-1}$), for example $3.0 \text{ mg} \cdot \text{l}^{-1}$, is found to be longest for *Tilapia mossambica* (175 minutes), followed by *Cyprinus carpio* (50 minutes) and *Rhinomugil corsula* (31 minutes) suggesting that the difference in resistance (survival) to PCP may be species-specific. When *R. corsula* was exposed to 0.1 and $0.133 \text{ mg} \cdot \text{l}^{-1}$ PCP, the standard metabolic rate was elevated by 37 and 45% respectively at 30°C , when compared to control fish ($112 \text{ mg kg}^{-1} \text{ hr}^{-1}$). In carp, the metabolic rate showed an increase to begin with, but later decreased during the test period (20 days), but the random (spontaneous) activity was seen to slope down as the number of exposure days increased. During exercise (35 cm s^{-1}) the rate of

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000671 CONTINUED oxygen consumption in the control and PCP treated *Tilapia* decreased with the duration of exercise (5 h), but the metabolic rate in the treated fish increased considerably.

84-000672 Pizza, J. C. PHARMACOKINETICS AND DISTRIBUTION OF DIETARY POLYCHLORINATED BIPHENYLS (PCBs) IN JUVENILE HUDSON RIVER STRIPED BASS, *MORONE SAXATILIS*. Ph.D. dissertation, N.Y. Univ. 119p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(7):2049. Jan. 1984. SFA 29(1)

84-000673 Roberts, R. J.; A. M. Bullock; M. Turner; K. Jones and P. Tett. MORTALITIES OF *SALMO GAIRDNERI* EXPOSED TO CULTURES OF *GYRODINIUM AUREOLUM*. *J. Mar. Biol. Assoc. U.K.* 63(4):741-743. Nov. 1983. SFA 29(1)

[Inst. Aquacult., Stirling Univ., Stirling FK9 4LA, Scotland] Rainbow trout were exposed to five different concentrations of a unialgal culture of *Gyrodinium aureolum* in laboratory tanks. All the concentrations used proved lethal within 24 h. The gills of the dead fish showed no mechanical occlusion by the algae but all displayed marked histological changes characterized by necrotic degeneration and disintegration of the lamellar epithelium.

84-000674 Roch, M. and J. A. McCarter. HEPATIC METALLOTHIONEIN PRODUCTION AND RESISTANCE TO HEAVY METALS BY RAINBOW TROUT (*SALMO GAIRDNERI*) -II. HELD IN A SERIES OF CONTAMINATED LAKES. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(1):77-82. 1984. SFA 29(1)

[Dep. Biochem. Microbiol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada] Rainbow trout held in net pens for 4 weeks in three locations contaminated by heavy metals developed elevated levels of hepatic metallothionein but no acclimation to a combination of zinc, copper and cadmium. Toxicity of the mixture of zinc, copper and cadmium in a ratio of 400:200:1 increased with temperature in the range of 6-21°C. Hepatic metallothionein concentrations after 4 weeks of exposure *in situ* was correlated with the degree of contamination as measured by zinc concentrations ($P < 0.01$).

84-000675 Roch, M. and J. A. McCarter. HEPATIC METALLOTHIONEIN PRODUCTION AND RESISTANCE TO HEAVY METALS BY RAINBOW TROUT (*SALMO GAIRDNERI*) -I. EXPOSED TO AN ARTIFICIAL MIXTURE OF ZINC, COPPER AND CADMIUM. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(1):71-75. 1984. SFA 29(1)

[Dep. Biochem. Microbiol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada] Rainbow trout developed elevated hepatic metallothionein concentrations after 4 weeks in a solution containing zinc, copper and cadmium in a fixed ratio of 400:20:1. Resistance to a combination of these metals increased in proportion to the concentration to which they were exposed for 4 weeks. The concentration of copper but not zinc or cadmium in the low molecular weight proteins separated by gel filtration was related to the concentrations of metallothionein present. The combined toxicity of the metals in the mixture was additive.

84-000676 Shires, S. W. THE USE OF SMALL ENCLOSURES TO ASSESS THE TOXIC EFFECTS OF CYPERMETHRIN ON FISH UNDER FIELD CONDITIONS. *Pestic. Sci.* 14(5):475-480. Oct. 1983. SFA 29(1)

[Shell Res. Ltd., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000677 Srivastava, A. K. and S. J. Agrawal. CHANGES INDUCED BY MANGANESE IN FISH TESTIS. *Experientia (Basel)* 39(11):1309-1310. 15 Nov. 1983. SFA 29(1)

[Dep. Zool., Univ. Gorakhpur, Gorakhpur-273001, India]

84-000678 Steele, C. W. COMPARISON OF THE BEHAVIOURAL AND ACUTE TOXICITY OF COPPER TO SHEEPSHEAD, ATLANTIC CROAKER AND PINFISH. *Mar. Pollut. Bull.* 14(11):425-428. Nov. 1983. SFA 29(1)

[Dep. Biol., Tex. A & M Univ., College Station 77843] Sheepshead (*Archosargus probatocephalus*), Atlantic croaker (*Micropogon undulatus*) and pinfish (*Lagodon rhomboides*) were each exposed to aqueous solutions of reagent grade cupric chloride in artificial seawater in four static bioassays. The 24, 48, 72 and 96-h TL_{50} were determined to be, respectively, 4.17, 3.02, 2.19 and 1.14 mg $Cu^{2+} \cdot l^{-1}m$ for sheepshead, 9.15, 7.55, 7.20 and 5.66 mg $Cu^{2+} \cdot l^{-1}$ for croaker, and 7.33, 4.43, 4.14 and 2.75 mg $Cu^{2+} \cdot l^{-1}$ for pinfish. These results are compared with literature values of experimental concentrations of copper producing subtle behavioral changes in these species.

84-000679 Swift, M. C. and R. P. Morgan. ACUTE TOXICITY OF NITRIC ACID TO FINGERLING RAINBOW TROUT (*SALMO GAIIRDNERI*). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):227-229. 1983. SFA 29(1)

[Univ. Md., CEES, Appalachian Environ. Lab., FSC, Gunter Hall, Frostburg 21532] The acute toxicity of nitric acid to fingerling rainbow trout was measured in 7 day bioassays at 11°C. The LC_{50} was about pH 4.0. Fish which died at low pH (3.0-4.0) exhibited classical symptoms of acid toxicity. Comparison of our results with other toxicity measurements suggests that nitric acid is intermediate in toxicity between H_2SO_4 and HCl at pH 3.0 and less toxic than either acid at pH 3.3 and above.

84-000680 Thomas, D. G.; A. Cryer; J. F. De L. G. Solbe and J. Kay. A COMPARISON OF THE ACCUMULATION AND PROTEIN BINDING OF ENVIRONMENTAL CADMIUM IN THE GILLS, KIDNEY AND LIVER OF RAINBOW TROUT (*SALMO GAIIRDNERI* RICHARDSON). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):241-246. 1983. SFA 29(1)

[Dep. Biochem., Univ. Coll., Cardiff, Wales]

84-000681 Tsai, C. and K. Chang. INTRASPECIFIC VARIATION IN COPPER SUSCEPTIBILITY OF THE BLUEGILL SUNFISH. *Arch. Environ. Contam. Toxicol.* 13(1):93-99. Jan. 1984. SFA 29(1)

[Chesapeake Biol. Lab., Cent. Environ. Estuarine Stud., Univ. Md., Solomons 20688-0038] Multiple regression analyses were conducted to establish the relationship between survival time, body weight, and effective concentration for different sex and age populations of the bluegill sunfish exposed to copper solutions. For the same unit of effective concentration adjusted with size factor, the survival times of age-0 males, age-0 females, age-1 males and age-1 females were, respectively, 2.77, 2.88, 4.20 and 6.30 times that of the juveniles; susceptibility to the toxic effect of copper decreased from small to large, young to old, and male to female.

84-000682 Walbridge, C. T.; J. T. Fiandt; G. L. Phipps and G. W. Holcombe. ACUTE TOXICITY OF TEN CHLORINATED ALIPHATIC HYDROCARBONS TO THE FATHEAD MINNOW (*PIMEPHALES PROMELAS*). *Arch. Environ. Contam. Toxicol.*

SPORT FISHERY ABSTRACTS

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-000682 CONTINUED 12(6):661-666. Nov. 1983. SFA 29(1)

[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804] Ninety-six-hour LC50 values were determined for 10 chlorinated aliphatic hydrocarbons in freshwater flow-through toxicity tests on fathead minnows (*Pimephales promelas*). The 96-hr measured LC50 values in mg/L from combined duplicate tanks were: tetrachloroethylene 13.4; 1,1',2,2'-tetrachloroethane 20.4; pentachloroethane 7.34; 1,1',2-trichloroethane 81.6; hexachlorobutadiene 0.10; 1,1'2-trichloroethylene 45.0; 1,2-dichloropropane 140; 1,2-dichloroethane 116; hexachloroethane 1.51; 1,3-dichloropropane 131.

84-000683 Walton, D. G.; L. L. Fancey; J. M. Green; J. W. Kiceniuk and W. R. Penrose. SEASONAL CHANGES IN ARYL HYDROCARBON HYDROXYLASE ACTIVITY OF A MARINE FISH *TAUTOGOLABRUS ADSPERSUS* (WALBAUM) WITH AND WITHOUT PETROLEUM EXPOSURE. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 76(2):247-253. 1983. SFA 29(1)

[Fish. Res. Br., Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

RESEARCH AND MANAGEMENT-GENERAL

84-000684 Arnett, G. R. POTENTIAL DEVELOPMENTS IN FISH AND WILDLIFE HABITAT POLICIES. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 48:475-479. 1983. SFA 29(1)

[U.S. Dep. Interior, Washington, DC]

84-000685 Fairfax, S. and L. Burton. A DECADE OF NEPA: MILESTONE OR MILLSTONE? *Fisheries (Bull. Am. Fish. Soc.)* 8(6):5-6, 8-9. Nov.-Dec. 1983. SFA 29(1)

[Coll. Nat. Resour., Univ. Calif., Berkeley]

84-000686 Laevastu, T. QUANTITATIVE RELATIONS BETWEEN FISHING MORTALITY, SPAWNING STRESS MORTALITY AND BIOMASS GROWTH RATE (COMPUTED WITH NUMERICAL MODEL FISHMO). *NOAA Tech. Mem. NMFS F/NWC-38.* 28p. Jan. 1983. From U.S. Government Reports 83(13):2832. 24 June 1983. Available from NTIS as PB83-169995. SFA 29(1)

84-000687 Panayotou, T. MANAGEMENT CONCEPTS FOR SMALL-SCALE FISHERIES: ECONOMIC AND SOCIAL ASPECTS. *FAO Fish. Tech. Pap. No. 228.* v + 53p. 1982. SFA 29(1)

[Fac. Econ., Kasetsart Univ., Bangkok 9, Thailand]

84-000688 Peterson, R. M. RIPARIAN AREA MANAGEMENT ON THE NATIONAL FOREST SYSTEM. *Fisheries (Bull. Am. Fish. Soc.)* 8(6):22-25. Nov.-Dec. 1983. SFA 29(1)

84-000689 Petr, T. (ed.) SUMMARY REPORT AND SELECTED PAPERS PRESENTED AT THE IPFC WORKSHOP ON INLAND FISHERIES FOR PLANNERS. INDO-PACIFIC FISHERIES COMMISSION (IPFC). MANILA, THE PHILIPPINES, 2-6 AUGUST 1982. *FAO Fish. Rep.* No. 288. vi + 191p. 1983. SFA 29(1)

[FAO of the UN, Rome, Italy]

SPORT FISHERY ABSTRACTS

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

84-000690 Salwasser, H.; C. K. Hamilton; W. B. Krohn; J. F. Lipscomb and C. H. Thomas. MONITORING WILDLIFE AND FISH: MANDATES AND THEIR IMPLICATIONS. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 48:297-307. 1983. SFA 29(1)
[U.S. For. Serv., Fort Collins, CO 80521]

84-000691 Varley, J. D. and P. Schullery. FISH WATCHING IN YELLOWSTONE... A GROWING PASTIME. *Natl. Parks* 57(7-8):22-24. July-Aug. 1982. SFA 29(1)

ADMINISTRATION AND PLANNING

84-000692 Taylor, W. W. and D. L. King. FISHERIES MONITORING AND MANAGEMENT IN FRESHWATER LAKES, RESERVOIRS, AND PONDS. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 48:342-348. 1983. SFA 29(1)
[Dep. Fish. Wildl., Mich. State Univ., East Lansing]

REPORTS OF FISHERY STATIONS, STATES, ETC.

84-000693 Mitsuoka, R. R.; R. E. Pearson; L. J. Rutledge and S. Waterman. FIFTY YEARS OF COOPERATION AND COMMITMENT: 1931-81. *NOAA Tech. Mem. NMFS F/NWC* 34. 291p. Oct. 1982. From U.S. Government Reports 83(10):2137. 13 May 1983. Available from NTIS as PB83-150755. SFA 29(1)

HABITAT ALTERATIONS

84-000694 Du Toit, R. F. SOME ENVIRONMENTAL ASPECTS OF PROPOSED HYDRO-ELECTRIC SCHEMES ON THE ZAMBEZI RIVER, ZIMBABWE. *Biol. Conserv.* 28(1):73-87. 1984. SFA 29(1)
[Dep. Biol. Sci., Univ. Zimbabwe, Box MP167, Mount Pleasant, Zimbabwe]

84-000695 Edwards, E. A. HABITAT SUITABILITY INDEX MODELS: LONGNOSE SUCKER. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.35*. vi + 21p. Sept. 1983. SFA 29(1)
[U.S. FWS, 2627 Redwing Rd., Fort Collins, CO 80526]

84-000696 Edwards, E. A.; G. Gebhart and O. E. Maughan. HABITAT SUITABILITY INFORMATION: SMALLMOUTH BASS. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.36*. vii + 47p. Sept. 1983. SFA 29(1)
[U.S. FWS, 2627 Redwing Rd., Fort Collins, CO 80526]

84-000697 McMahon, T. E. HABITAT SUITABILITY INDEX MODELS: COHO SALMON. *U.S. Fish Wildl. Serv. FWS/OBS-82/10.49*. vi + 29p. Sept. 1983. SFA 29(1)
[U.S. FWS, 2627 Redwing Rd., Fort Collins, CO 80526]

84-000698 Morris, B. F. ASSESSMENT OF THE LIVING MARINE RESOURCES OF THE CENTRAL BERING SEA AND POTENTIAL RESOURCE USE CONFLICTS BETWEEN COMMERCIAL FISHERIES AND PETROLEUM DEVELOPMENT IN THE NAVARIN BASIN, PROPOSED SALE NO.

SPORT FISHERY ABSTRACTS

HABITAT ALTERATIONS (CONTINUED)

84-000698 CONTINUED 83. NOAA Tech. Mem. NMFS F/AKR 2. 243p. Jan. 1981. From U.S. Government Reports 83(11):2377. 27 May 1983. Available from NTIS as PB83-159889. SFA 29(1)

84-000699 Shomura, R. S. and W. M. Matsumoto. STRUCTURED FLOTSAM AS FISH AGGREGATING DEVICES. NOAA Tech. Mem. NMFS SWFC 22. 14p. Oct. 1982. From U.S. Government Reports 83(6):966. 18 Mar. 1983. Available from NTIS as PB83-138271. SFA 29(1)

A modern adaptation of an old fishing technique is gaining recognition in the Pacific and elsewhere as an effective means to increase fishing productivity in the open sea. The use of man-made, free floating, and anchored floating devices to aggregate pelagic fishes for subsistence, recreational, and commercial fishing has increased markedly in recent years. This report reviews the development and present use of fish aggregating devices in the Pacific and Indian Oceans.

84-000700 Smith, R. H.; G. T. Stevens, Jr.; T. B. Grace and A. S. Weithman. THE INFLUENCE OF CHANNEL REGULATING STRUCTURES ON FISH AND WILDLIFE HABITAT (GREAT-III). Univ. Mo. Rolla. Inst. River Stud. 84p. Aug. 1982. From U.S. Government Reports 83(6):1079. 18 Mar. 1983. Available from NTIS as AD-A 121 607/6. SFA 29(1)

The study focused on measuring existing conditions and fish habitat around a selected group of river regulating structures. Prototype data was collected at dikes of varying design and location. Such data was subsequently used to determine specifics in regard to the fish habitat that exists around each type of dike analyzed. The purpose of this study is two-fold: To evaluate aquatic habitat diversity, accretion patterns, flow patterns and bed material gradation existing around in-place channel regulating structures at different locations and of varying design; and to recommend, where possible, data needs and structure modifications which will maintain or improve existing fish and wildlife habitat while preserving the geometry needed to maintain an acceptable navigations channel.

84-000701 Trial, J. G.; C. S. Wade; J. G. Stanley and P. C. Nelson. HABITAT SUITABILITY INFORMATION: COMMON SHINER. U.S. Fish Wildl. Serv. FWS/OBS-82/10.40. vi + 22p. Sept. 1983. SFA 29(1)

[Me. Coop. Fish. Res. Unit, Univ. Me., Orono 04473]

84-000702 Trial, J. G.; C. S. Wade; J. G. Stanley and P. C. Nelson. HABITAT SUITABILITY INFORMATION: FALLFISH. U.S. Fish Wildl. Serv. FWS/OBS-82/10.48. vi + 15p. Sept. 1983. SFA 29(1)

[Me. Coop. Fish. Res. Unit, 313 Murray Hall, Univ. Me., Orono 04473]

84-000703 White, M. R. OPPORTUNITIES TO PROTECT INSTREAM FLOWS IN MICHIGAN AND WISCONSIN. U.S. Fish Wildl. Serv. FWS/OBS-82/21. xix + 73p. Sept. 1983. SFA 29(1)

[303 First of Bear Valley Bldg., 5353 W. Dartmouth Ave., Denver, CO 80227]

84-000704 White, M. R. OPPORTUNITIES TO PROTECT INSTREAM FLOWS IN TEXAS, OKLAHOMA, AND ARKANSAS. U.S. Fish Wildl. Serv. FWS/OBS-83/22. xxv + 94p. Sept. 1983. SFA 29(1)

[303 First of Bear Valley Bldg., 5353 W. Dartmouth Ave., Denver, CO 80227]

SPORT FISHERY ABSTRACTS

HARVEST, CREEL CENSUS, ETC.

84-000705 Harris, C. and E. Bergersen. WHAT DO ANGLERS WANT? *Colo. Outdoors* 33(1):30-34. Jan.-Feb. 1984. SFA 29(1)
[E. Bergersen: Coop. Fish. Res. Unit, Colo. State Univ., Fort Collins 80523]

84-000706 Jordan, S. W. and D. R. Talhelm. ECONOMIC IMPACTS OF SPORTS FISHING IN ALCONA COUNTY. *Mich. State Univ. Sea Grant Prog. Rep.* MICHU-SG-82-204. 76p. Sept. 1982. From U.S. Government Reports 83(10):2138. 13 May 1983. Available from NTIS as PB83-153361. SFA 29(1)

Great Lakes sport fishing has developed over the past fifteen years into one of Michigan's major recreational pursuits and tourist attractions. The project had three major goals. The first goal was to estimate the annual number of resident and non-resident angler days spent fishing on Lake Huron in Alcona County. The second goal was to estimate the annual expenditures of non-resident anglers. The third goal was to give all parties with an interest in the sport fisheries in Alcona County an opportunity to express their thoughts, concerns, plans, and feelings about sport fishing's impact on the individual and the community.

84-000707 Matlock, G. C. ANGLER ORIGIN AND THEIR CATCH RETENTION RATE WHILE FISHING ON SEVEN TEXAS BAY SYSTEMS. *N. Am. J. Fish. Manage.* 3(4):438-444. 1983. SFA 29(1)

[Tex. Parks Wildl. Div., 4200 Smith Sch. Rd., Austin 78744]

84-000708 McEachron, L. W. and G. C. Matlock. AN ESTIMATE OF HARVEST BY THE TEXAS CHARTER BOAT FISHERY. *Mar. Fish. Rev.* 45(1):11-17. Jan. 1983. SFA 29(1)

[Tex. Parks Wildl. Dep., Box 1707, Rockport 78382]

84-000709 Phillips, G. M. INTERACTIONS BETWEEN FISHING EFFORT AND CATCH PER UNIT EFFORT IN THE SAN PEDRO FISHERY: A STATISTICAL NOTE. *Calif. Coop. Oceanic Fish. Invest.* 24:255-258. Oct. 1983. In English with Spanish summ. SFA 29(1)

[Dep. Finance Business Econ., Grad. Sch. Business, Univ. South. Calif., Los Angeles 90089] Time series methods are applied to daily data of trips and average catch per trip (effort and CPUE) for anchovy and mackerel fishing in the San Pedro, California, purse seine fishery. The study shows that high fishing effort leads to a slight increase in CPUE, whereas high CPUE attracts additional fishing effort. The data show little evidence of local stock depletion in the short run. An additional result is that forecast models of anchovy or mackerel CPUE should not be cast in a single equation framework; rather, a four-equation system simultaneously forecasting CPUE and effort for each species is the appropriate specification.

REGULATIONS

84-000710 Bohnsack, J. A. CHANGES IN REEF FISH POPULATIONS AT LOOE KEY NATIONAL MARINE SANCTUARY. *Am. Zool.* 23(4):986. 1983. Abstract only. SFA 29(1)

[Univ. Miami, FL] This study examines the changes in reef fish populations at Looe Key National Marine Sanctuary, Florida Keys, following the prohibition of spearfishing in 1980. Visual fish surveys conducted prior to

SPORT FISHERY ABSTRACTS

REGULATIONS (CONTINUED)

84-000710 CONTINUED sanctuary establishment showed significantly smaller piscivorous predator populations, significant differences in prey species composition, and significant differences in predator composition compared to control reefs (Molasses and French Reefs) in the Key Largo Coral Reef Sanctuary which had been protected from spearfishing since 1960. Most predator populations significantly increased after the spearfishing ban although some population levels remain well below those on control reefs. Results show the resiliency of certain reef fish species to reduced harvesting pressures.

FISH CONTROL AND REMOVAL

84-000711 Marking, L. L.; T. D. Bills; J. J. Rach and S. J. Grabowski. CHEMICAL CONTROL OF FISH AND FISH EGGS IN THE GARRISON DIVERSION UNIT, NORTH DAKOTA. *N. Am. J. Fish. Manage.* 3(4):410-418. 1983. SFA 29(1)
[USFWS, Natl. Fish. Res. Lab., P.O. Box 818, La Crosse, WI 54601]

84-000712 Neth, P. C. and T. Jolliff. SEA LAMPREY IN NEW YORK STATE. *Conservationist* 38(4):42-47. Jan.-Feb. 1984. SFA 29(1)
[N. Y. Dep. Environ. Conserv., Bur. Fish., Cape Vincent, NY]

MARKING AND TAGGING

84-000713 Pierson, J. M. and D. R. Bayne. LONG-TERM RETENTION OF FLUORESCENT PIGMENT BY FOUR FISHES USED IN WARMWATER CULTURE. *Prog. Fish-Cult.* 45(3):186-188. July 1983. SFA 29(1)
[G. S. C. Bldg. No. 8, Ala. Power Co., Birmingham 35291]

STOCKING AND INTRODUCTIONS

84-000714 Cadwallader, P. L. A REVIEW OF FISH STOCKING IN THE LARGER RESERVOIRS OF AUSTRALIA AND NEW ZEALAND. *FAO Fish. Circ.* No. 757. v + 38p. Aug. 1983. SFA 29(1)

[Snobs Creek Freshwater Fish. Res. Stn. Hatchery, Fish. Wildl. Div., Minist. Conserv., Victoria, Australia] This is a review of stocking native and exotic fish species in Australian and New Zealand reservoirs. As the sport fishery is the far dominant type of fishing activity on these water bodies, most effort has been spent on stocking salmonids. *Salmo gairdneri* and *S. trutta* have been the main species stocked in reservoirs in New Zealand and the cooler parts of Australia. In New Zealand, *S. gairdneri* are self-sustaining and form the basis for a major recreational fishery. Trout stocking aspects are dealt with in detail and alternatives to stocking with trout are suggested. More recently, there has been a tendency to stock preferentially native fish wherever ecological conditions allow. There is great scope and potential for stocking indigenous fish, particularly in south-eastern Australia, but Queensland is at present the only Australian state whose reservoir stocking is now based entirely on Australian native fish.

STOCKING AND INTRODUCTIONS (CONTINUED)

84-000715 Krieger, D. EVALUATION OF STOCKING YEARLING LARGEMOUTH BASS IN CHATFIELD RESERVOIR, COLORADO. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:54-59. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Colo. Div. Wildl., 317 W. Prospect, Fort Collins 80526] Largemouth bass (*Micropterus salmoides*) were produced at the Wray Hatchery using intensive and extensive culture from 1979 to 1982. At 1 year of age the bass were sprayed with a fluorescent pigment using compressed air and then stocked into Chatfield reservoir, a 465-ha impoundment near Denver. Electrofishing recoveries indicated that at 2 years of age, stocked bass comprised 12%, 59%, and 59% of all bass in their particular year-class in 1979, 1980, and 1982, respectively. Growth of stocked bass was equal to, or greater than, natural bass, but mark retention may be low after the second year. During the next few years of the study, mark retention and the effects of stocking on the fishery will be evaluated.

FISHING GEAR AND TECHNIQUES

84-000716 Arimoto, T.; Y. Inoue and M. Ogura. [DIEL VARIATION OF CATCH IN COASTAL SET-LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(8):1175-1181. Aug. 1983. In Japanese with English summ. SFA 29(1)

[Dep. Fish. Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato, Tokyo 108, Japan]

84-000717 Brabant, J. and C. Nédélec. BOTTOM TRAWLS FOR SMALL-SCALE FISHING: ADAPTATION FOR PAIR TRAWLING. *FAO Fish. Tech. Pap.* No. 189. v + 10p. 1983. SFA 29(1)

[Inst. Sci. Tech. Peches Marit., 62200 Boulogne-sur-Mer, France]

84-000718 Field-Dodgson, M. S. EMERGENT FRY TRAP FOR SALMON. *Prog. Fish-Cult.* 45(3):175-176. July 1983. SFA 29(1)

[Fish. Res. Div., Kyle St., Riccarton, Christchurch, New Zealand]

84-000719 Galbraith, R. D. THE MARINE LABORATORY FOUR-PANEL TRAWL. *Scott. Fish. Inf. Pam.* No. 8. 21p. 1983. SFA 29(1)

[Mar. Lab., Aberdeen, Scotland]

84-000720 García, C. DESCRIPCIÓN DE EQUIPO SELECCIONADOR PARA PECES DE PLATAFORMA. [DESCRIPTION OF SELECTIVE EQUIPMENT FOR INSHORE FISHES.] *Rev. Cubana Invest. Pesq.* 5(1):78-83. 1980. In Spanish with English summ. SFA 29(1)

[Cent. Invest. Pesq., Havana, Cuba]

84-000721 Hammer, C. IMPROVEMENT OF A FRY TRAP AND INVESTIGATIONS ON THE CATCH RATE IN A LIMNIC ENVIRONMENT. *Arch. Hydrobiol.* 98(4):533-544. 1983. SFA 29(1)

[Inst. Hydrobiol. Fischereiwiss., Univ. Hamburg, Olbersweg 24, D-2000 Hamburg 50, West Germany]

FISHING GEAR AND TECHNIQUES (CONTINUED)

- 84-000722 Imai, T. [EXPERIMENTAL STUDIES ON THE SURFACE AREAS OF THE WEAVER'S KNOT AND THE REEF KNOT.] *Bull. Jpn. Soc. Sci. Fish.* 49(8):1195-1198. Aug. 1983. In Japanese with English summ. SFA 29(1)
[Lab. Fish. Gear, Fac. Fish., Kagoshima Univ., Shimoarata-4, Kagoshima 890, Japan]
- 84-000723 Lippincott, B. L. and R. F. Thomas. NEUSTON NET FOR SAMPLING SURFACE ICHTHYOPLANKTON. *Prog. Fish-Cult.* 45(3):188-190. July 1983. SFA 29(1)
[Lawler, Matusky & Skelly Engineers, One Blue Hill Plaza, Pearl River, NY 10965]
- 84-000724 Main, J. and G. I. Sangster. TUV II - A TOWED WET SUBMERSIBLE FOR USE IN FISHING GEAR RESEARCH. *Scott. Fish. Res. Rep. No. 29.* 19p. 1983. SFA 29(1)
[Mar. Lab., Aberdeen, Scotland]
- 84-000725 Miura, T. and S. Shimizu. [SYSTEM PARAMETER ESTIMATION OF THE TRAP MODEL FOR SOME SPECIES OF FISH.] *Bull. Jpn. Soc. Sci. Fish.* 49(9):1355-1360. Sept. 1983. In Japanese with English summ. SFA 29(1)
[Fac. Fish., Hokkaido Univ., Hokodate 041, Japan]
- 84-000726 Mutton, B. ENGINEERING APPLICATIONS: 2. HAULING DEVICES FOR SMALL FISHING CRAFT. *FAO Fish. Tech. Pap. No. 229.* xiii + 146p. 1982. SFA 29(1)
[75 Mongleath Rd., Falmouth, Cornwall TR11 5EP, England]
- 84-000727 Smolowitz, R. J. MESH SIZE AND THE NEW ENGLAND GROUND FISHERY - APPLICATIONS AND IMPLICATIONS. *NOAA Tech. Rep. NMFS SSRF 771.* iv + 60p. July 1983. SFA 29(1)
[NMFS, Woods Hole, MA 02543]
- 84-000728 Treshchev, A. I.; M. P. Aronov; V. F. Mytsul; E. P. Yakovleva and T. G. Tariverdieva (eds.). [INVESTIGATIONS OF FISHING TECHNIQUES AND BEHAVIOR OF FISH.] *All-Union Res. Inst. Mar. Fish. Oceanogr. (USSR)* 178p. 1983. In Russian with English summ. A collection of papers.--RS. SFA 29(1)
[VNIRO, Moscow, USSR]
- 84-000729 Vooren, C. M. SELEÇÃO PELA MALHA NA PESCA DE ARRASTO DA CASTANHA UMBRINA CANOSAI, PESCAÇA CYNOSCIION STRIATUS E PESCADINHA MACRODON ANCYLODON NO RIO GRANDE DO SUL. [MESH SELECTION IN THE TRAWL FISHERY FOR CASTANHA UMBRINA CANOSAI, PESCAÇA CYNOSCIION STRIATUS AND PESCADINHA MACRODON ANCYLODON, OF RIO GRANDE DO SUL.] *Doc. Tech. Oceanogr.* 4. 32p. Sept. 1983. In Portuguese with English summ. SFA 29(1)
- FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.
- 84-000730 Knapp, W. E.; B. Kynard and S. P. Gloss. POTENTIAL EFFECTS OF KAPLAN, OSSBERGER AND BULB TURBINES ON ANADROMOUS FISHES OF THE NORTHEAST UNITED STATES. *U.S. Fish Wildl. Serv. FWS/OBS-82/62.* 145p. Sept. 1982.

SPORT FISHERY ABSTRACTS

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC. (CONTINUED)

84-000730 CONTINUED From U.S. Government Reports 83(11):2353. 27 May 1983. Available from NTIS as PB83-158410. SFA 29(1)

84-000731 Stober, Q. J.; R. W. Tyler and C. E. Petrosky. BARRIER NET TO REDUCE ENTRAINMENT LOSSES OF ADULT KOKANEE FROM BANKS LAKE, WASHINGTON. *N. Am. J. Fish. Manage.* 3(4):331-354. 1983. SFA 29(1)
[Fish. Res. Inst., Univ. Wash., Seattle 98195]

84-000732 Uziel, M. S. and E. H. Hannon. IMPINGEMENT: AN ANNOTATED BIBLIOGRAPHY. *Oak Ridge Natl. Lab. ORNL/EIS-135*. 203p. Apr. 1979. From U.S. Government Reports 83(12):2592. 10 June 1983. Available from NTIS as DE82000921. SFA 29(1)

MATHEMATICS, STATISTICAL METHODS, AND MODELING

84-000733 Charles, A. T. OPTIMAL FISHERIES INVESTMENT UNDER UNCERTAINTY. *Can. J. Fish. Aquatic Sci.* 40(12):2080-2091. Dec. 1983. In English with French summ. SFA 29(1)
[Dep. Fish. Oceans, Fish. Res. Br., Vancouver, BC V6E 2P1, Canada]

84-000734 Charles, A. T. OPTIMAL FISHERIES INVESTMENT: COMPARATIVE DYNAMICS FOR A DETERMINISTIC SEASONAL FISHERY. *Can. J. Fish. Aquatic Sci.* 49(12):2069-2079. Dec. 1983. In English with French summ. SFA 29(1)
[Dep. Fish. Oceans, Fish. Res. Br., Vancouver, BC V6E 2P1, Canada]

84-000735 Clark, J. E. PARAMETER ESTIMATION FOR A CLASS OF MODELS DESCRIBING THE MIGRATORY TIMING OF CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*) IN THE LOWER YUKON RIVER, ALASKA. *Alaska Dep. Fish Game Inf. Leafl.* No. 224. viii + 102p. Oct. 1983. SFA 29(1)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau 99802]

84-000736 Collie, J. S. and M. P. Sissenwine. ESTIMATING POPULATION SIZE FROM RELATIVE ABUNDANCE DATA MEASURED WITH ERROR. *Can. J. Fish. Aquatic Sci.* 40(11):1871-1879. Nov. 1983. In English with French summ. SFA 29(1)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

84-000737 DeAngelis, D. L. and G. T. Yeh. INTRODUCTION TO MODELING FISH MIGRATORY BEHAVIOR. *Oak Ridge Natl. Lab. CONF-821218-1*. 49p. 1982. From U.S. Government Reports 83(14):3055. 8 July 1983. Available from NTIS as DE83004651. SFA 29(1)

84-000738 Hutchins, M. L. LAKE ECOSYSTEM RESPONSE TO FISH MANAGEMENT--A STEADY-STATE MODELING INVESTIGATION. *Univ. Me. Land Water Resour. Cent. OWRT-A-056-ME(1)*. 30p. Dec. 1982. From U.S. Government Reports 83(14):3063. Available from NTIS as PB83-178103. SFA 29(1)

An input/output steady-state model descriptive of a simple five-component lake ecosystem was used to investigate possible long-term ecosystem response to selected fish management practices. In particular, the response of game fish and algal standing crops to various fish manipulations is explored. In general, harvesting game fish stimulates game fish production, while stocking

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

84-000738 CONTINUED game fish suppresses production. Stocking game fish appears justified only in situations of over-harvest, and then only in amounts which exactly cover the excess harvest.

84-000739 McCarl, B. A. and R. B. Rettig. INFLUENCE OF HATCHERY SMOLT RELEASES ON ADULT SALMON PRODUCTION AND ITS VARIABILITY. *Can. J. Fish. Aquatic Sci.* 40(11):1880-1886. Nov. 1983. In English with French summ. SFA 29(1)

[Dep. Agric. Resour. Econ., Oreg. State Univ., Corvallis 97331]

84-000740 Mittelbach, G. G. OPTIMAL FORAGING AND GROWTH IN BLUEGILLS. *Oecologia (Berl.)* 59(2-3):157-162. Sept. 1983. SFA 29(1)

[Dep. Zool., Ohio State Univ., Columbus 43210] Two models of foraging behaviour (optimal prey selection and random prey selection) were used to calculate the potential net energy intake of bluegill sunfish (*Lepomis macrochirus*) in a small Michigan lake. These predictions were then compared to the actual growth exhibited by bluegills in the lake. Predictions of net energy gain derived from optimal foraging criteria were significantly correlated with the seasonal gain in mass by the fish; both energy gain and growth were positively related to bluegill length. Predictions of net energy intake based upon non-selective foraging (i.e. prey eaten as encountered) were not significantly correlated with bluegill growth. Comparing the net energy intake of bluegills feeding optimally versus non-selectively demonstrates that optimal prey selection increases average energy gain by 4 to 10 fold. This result illustrates the strong evolutionary advantage afforded to foragers that maximize net energy intake in a natural environment. Finally, the potential usefulness of optimal foraging models to the study of species and/or size-class interactions is discussed and a heuristic example pertaining to the development of "stunted" populations in fishes is provided.

84-000741 Reed, M. A MULTIDIMENSIONAL CONTINUUM MODEL OF FISH BEHAVIOR. *Ecol. Model.* 20(4):311-322. Dec. 1983. SFA 29(1)

[Appl. Sci. Assoc., Wakefield, RI 02879]

84-000742 Schnute, J. A NEW APPROACH TO ESTIMATING POPULATIONS BY THE REMOVAL METHOD. *Can. J. Fish. Aquatic Sci.* 40(12):2153-2169. Dec. 1983. In English with French summ. SFA 29(1)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-000743 Stauffer, G. D. CALIBRATION OF NORTHERN ANCHOVY SPAWNING BIOMASS ESTIMATES DERIVED BY EGG PRODUCTION AND LARVAL CENSUS METHODS. *Calif. Coop. Oceanic Fish. Invest.* 24:11-15. Oct. 1983. In English with Spanish summ. SFA 29(1)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-000744 Steinnes, D. N. and R. L. Raab. A TIME SERIES APPROACH TO FORECASTING ANGLING ACTIVITY AT A RECREATIONAL SITE BASED ON PAST SUCCESSES. *Can. J. Fish. Aquatic Sci.* 40(12):2189-2193. Dec. 1983. In English with French summ. SFA 29(1)

[Dep. Econ., Univ. Minn., Duluth 55812]

SPORT FISHERY ABSTRACTS

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

84-000745 Taivo, L. and R. J. Marasco. A SINGLE SPECIES, BIOMASS BASED, TIME DEPENDENT MODEL FOR INVESTIGATING THE EFFECTS OF FISHING ON THE DYNAMICS OF FISH BIOMASS. *NOAA Tech. Mem. NMFS F/NWC* 41. iii + 41p. Jan. 1983. From Monthly Catalog of U.S. Gov. Publ. p. 39. Dec. 1983. SFA 29(1)

84-000746 Yundt, S. CHANGES IN CATCHABILITY RELATED TO MULTIPLE ELECTROSHOCK. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:22-28. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Wyo. Game Fish Dep., Laramie 82070] Electrofishing mark/recapture population estimates were shown to be affected by the length of time between the mark and recapture runs. On six different Wyoming streams, population estimates made with 0 to 3 days (within week) between mark and recapture runs averaged 75.1 and 54.0% for rainbow (*Salmo gairdneri*) and brown trout (*Salmo trutta*), respectively, of population estimates made with 6 to 10 days (between week) between mark and recapture runs. Movement information collected from the Big Horn River, Wyoming, suggested that movement of marked rainbow trout out of the study section was not responsible for the difference between within week versus between week estimates. Rather, the difference seemed to be due to a change in the probability of capture following exposure to electroshock.

RIVER AND STREAM MANAGEMENT AND RESEARCH

84-000747 Alexander, G. R. and E. A. Hansen. SAND SEDIMENT IN A MICHIGAN TROUT STREAM. PART II. EFFECTS OF REDUCING SAND BEDLOAD ON A TROUT POPULATION. *N. Am. J. Fish. Manage.* 3(4):365-372. 1983. SFA 29(1)

[Mich. Dep. Nat. Resour., Hunt Ck. Fish. Res. Stn., Rt. 2, Box 2299, Lewiston, MI 49756]

84-000748 Apple, L. L. THE USE OF BEAVERS IN RIPARIAN/AQUATIC HABITAT RESTORATION IN A COLD DESERT, GULLY-CUT STREAM SYSTEM: A CASE HISTORY. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:29-35. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Bur. Land Manage., P.O. Box 1869, Rock Springs, WY 82901] A study project was initiated in 1981 to develop techniques for restoring and reestablishing degraded riparian and aquatic habitat on two perennial streams in southwestern Wyoming. The major objective was to utilize primarily "natural" systems to restore the habitat rather than use labor and capital-intensive artificial methods. One study area was fenced to exclude livestock grazing and one was left unfenced. The riparian vegetation was rested and beaver were reintroduced to the fenced study area; the beaver returned on their own to the unfenced study area. Aspen trees were delivered to the sites of beaver activity on both streams because large materials for stable dam building was not present. The newly built beaver dams are trapping sediment, reducing stream velocity, and locally elevating the water table, thus allowing for the reestablishment of willow and other riparian plants in an expanded riparian zone, which stabilizes the stream banks, and improves aquatic habitat.

84-000749 Bilgrami, K. S.; J. S. Datta Munshi and N. K. Singh. IMPORTANCE OF CONSERVING JUVENILE FISHES IN THE RIVER GANGES. *Environ. Conserv.* 10(3):258-259. 1983. SFA 29(1)

[Dep. Bot., Bhagalpur Univ., Bhagalpur 812007, India]

SPORT FISHERY ABSTRACTS

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

84-000750 Chauvet, E. INFLUENCE D'UNE RÉDUCTION DE DÉBIT SUR UN TORRENT DE MONTAGNE: L'ASTON (ARIÈGE). [INFLUENCE OF A REDUCTION IN FLOW ON A MOUNTAIN RIVER: THE ASTON (ARIÈGE).] *Ann. Limnol.* 19(1):45-49. 1983. In French with English summ. SFA 29(1)
[Cent. Ecol. Ressour. Renow. (C.N.R.S.), 29, rue J. Marwig, 31055 Toulouse Cedex, France]

84-000751 Hansen, D. J. A SYSTEMS APPROACH TO UNDERSTANDING AND MANAGING RIPARIAN PLANT COMMUNITIES IN THE UTAH MOUNTAINS OF UTAH. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:60-65. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)
[Native Plants, Inc., 360 Wakara Way, Salt Lake City, UT 84108]

84-000752 Hansen, E. A.; G. R. Alexander and W. H. Dunn. SAND SEDIMENT IN A MICHIGAN TROUT STREAM. PART I. A TECHNIQUE FOR REMOVING SAND BEDLOAD FROM STREAMS. *N. Am. J. Fish. Manage.* 3(4):355-364. 1983. SFA 29(1)
[U.S. For. Serv., North Cent. For. Exp. Stn., For. Sci. Lab., P.O. Box 898, Rhinelander, WI 54501]

84-000753 Munther, G. L. INTEGRATION OF BEAVER INTO FOREST MANAGEMENT. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:73-80. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)
[134 River Plains Rd., Missoula, MT 59801]

84-000754 Sindermann, C. J. (ed.). PROCEEDINGS OF THE SIXTH U.S.-JAPAN MEETING ON AQUACULTURE, SANTA BARBARA, CALIFORNIA, AUGUST 27-28, 1977. *NOAA Tech. Rep. NMFS Circ.* 442. iii + 66p. Mar. 1982. SFA 29(1)

84-000755 Stabler, F. MULTIPLE-USE MANAGEMENT OF GRAZED VALLEY BOTTOMS FOR SUMMER STREAMFLOW INCREASE. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:66-72. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)
[Bur. Land Manage., Box 670, Rawlins, WY 82301] Summer flow increases in small, western streams have been reported after suppression of woody streamside vegetation, removal of livestock from streambanks, and dam construction. Findings suggest that instream and streamside factors play a more important role in runoff processes in lower order drainages than is generally supposed. There may be other misconceptions about the relationships between streamflow and the soils, vegetation, and land uses in small valley bottoms. Woody riparian plants and beaver play important roles in summer streamflow maintenance in naturally-functioning ecosystems, and the riparian system has other flow maintenance functions which are not fully understood. Evaporation, and transpiration by non-riparian vegetation, may result in greater losses to summer streamflow than is generally supposed. Combined management of water tables, livestock grazing, and non-riparian vegetation in smaller valley bottoms represents a possible approach to the enhancement of summer streamflow, forage production for livestock, and wildlife habitat. Improved understanding of the complexities of summer streamflow generation and maintenance could lead to viable multiple-use approaches to management of small, grazed valley bottoms.

RIVER AND STREAM MANAGEMENT AND RESEARCH (CONTINUED)

84-000756 Van Deventer, J. S. and W. S. Platts. SAMPLING AND ESTIMATING FISH POPULATIONS FROM STREAMS. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 48:349-354. 1983. SFA 29(1)

[Corporate Information Systems, Morrison-Knudsen Co., Inc., Boise, ID]

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

84-000757 Day, R. E.; F. Stevenson; K. O. Paxton and M. R. Austin. LIMNOLOGY AND FISH POPULATIONS OF BEAVER CREEK RESERVOIR, OHIO, 1972-1975. *Ohio Fish Wildl. Rep.* 9. 56p. July 1983. SFA 29(1)

[Available from K. W. Laub, Tech. Ed., Ohio Dep. Nat. Resour., Div. Wildl., 1500 Dublin Rd., Columbus 43215]

84-000758 Hubert, W. A. POTENTIAL FOR USE OF BLACK BASS TO DIVERSIFY FISHING OPPORTUNITIES IN COLD DESERT ENVIRONMENTS. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:12-21. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Wyo. Coop. Fish. Wildl. Res. Unit, Univ. Wyo., Laramie 82071] Black bass distribution in Wyoming is limited by the short cool summers at high elevations. It is unlikely that naturalized populations can be established above 1900m (6200 ft.). Several predator-prey combinations have been tried in Wyoming and other northerly climates with 100 to 150 day growing seasons, but none has consistently produced quality fisheries. Bass fisheries in small impoundments could provide recreational opportunities in Wyoming, but strict harvest restrictions would probably be needed to maintain angling quality.

84-000759 Mosher, T. D. EFFECTS OF ARTIFICIAL CIRCULATION ON FISH DISTRIBUTION AND ANGLING SUCCESS FOR CHANNEL CATFISH IN A SMALL PRAIRIE LAKE. *N. Am. J. Fish. Manage.* 3(4):403-409. 1983. SFA 29(1)

[Kans. Fish Game Comm., 832 East 6th St., Emporia 66801]

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

84-000760 Davis, J. A. and C. A. Carlson. THE BROWN TROUT FISHERY IN DILLON RESERVOIR, COLORADO, 1979-1980. *Proc. Annu. Meet. Colo.-Wyo. Chap. Am. Fish. Soc.* 18:36-47. 1983. Proceedings available @ \$10.00 from Mary McAfee, 711 Independent Ave., Grand Junction, CO 81505. SFA 29(1)

[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523] Mean length and weights for brown trout (*Salmo trutta*) collected from Dillon Reservoir and the Blue River were significantly lower in 1980 than in 1979. Growth of brown trout 2-4 years of age was slowest and growth of brown trout 5-6 years of age was fastest. The length-weight relationship was almost identical in 1979 and 1980. Condition tended to decrease in brown trout 2-4 years of age and increase in older fish. Female brown trout outnumbered males during the 1979 and 1980 spawning migrations up the Blue River. Total number of brown trout in the Blue River spawning migration has declined since 1977. Total number of brown trout harvested from Dillon Reservoir was estimated to be 2063 and 1407 in 1979 and 1980, respectively. Catch per angler hour was 0.011 and 0.009 in 1979 and 1980, respectively. Angler hours per season were 183,251 and 149,940 in 1979 and 1980, respectively. Brown trout spawning habitat was 1.8% (936 m) of the total Blue River

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

84-000760 CONTINUED study area (50,841 m²). Much of the available spawning habitat was confined to small areas along streambanks. Spawning substrate ranged 0.25-76 mm in diameter with 16-64 mm the most abundant category.

84-000761 Ita, E. O. and T. Petr. SELECTED BIBLIOGRAPHY ON MAJOR AFRICAN RESERVOIRS. *CIFA Occas. Pap.* No. 10. v + 53p. 1983. SFA 29(1)
[Kainji Lake Res. Inst., P.M.B. 666, New Bussa, Kwara State, Nigeria]

ESTUARY MANAGEMENT AND RESEARCH

84-000762 Copeland, B. J.; R. G. Hodson; S. R. Riggs and J. E. Easley, Jr. THE ECOLOGY OF ALBEMARLE SOUND, NORTH CAROLINA: AN ESTUARINE PROFILE. *U.S. Fish. Wildl. Serv. FWS/OBS-83.01.* xii + 68p. Sept. 1983. SFA 29(1)
[Sea Grant Prog., N. C. State Univ., Raleigh]

84-000763 Hager, M. C. and A. J. Bulger, Jr. ESTUARINE DEMERSAL FISH: A STUDY OF SPECIES DIVERSITY TRENDS IN A NEW ENGLAND FISH COMMUNITY. *Va. J. Sci.* 34(3):122. 1983. Abstract only. SFA 29(1)
[Dep. Biol., Univ. Va., Charlottesville 22901]

84-000764 Lindall, W. N., Jr. and G. W. Thayer. QUANTIFICATION OF NATIONAL MARINE FISHERIES SERVICE HABITAT CONSERVATION EFFORTS IN THE SOUTHEAST REGION OF THE UNITED STATES. *Mar. Fish. Rev.* 44(12):18-22. Dec. 1982. SFA 29(1)
[NMFS, 9450 Koger Blvd., St. Petersburg, FL 33702]

MARINE MANAGEMENT AND RESEARCH

84-000765 Ardill, J. D. FISHERIES IN THE SOUTHWEST INDIAN OCEAN. *Ambio* 12(6):341-344. 1983. SFA 29(1)
[SWIO Proj., Botanical Gardens, Mont Fleuri, Mahé, Seychelles]

84-000766 Bedford, D. W. and F. B. Hagerman. THE BILLFISH FISHERY RESOURCE OF THE CALIFORNIA CURRENT. *Calif. Coop. Oceanic Fish. Invest.* 24:70-78. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Calif. Dep. Fish Game, Mar. Resour. Reg., 245 W. Broadway, Long Beach 90802]

84-000767 Blanco, W.; R. Valdéz and A. Pérez. EVALUACIÓN DE LA PESQUERÍA DE LA CHERNA AMERICANA (*EPINEPHELUS MORIO*, PERCIFORMES, SERRANIDAE) EN EL BANCO DE CAMPECHE. [EVALUATION OF THE FISHERY FOR RED GROUPER (*EPINEPHELUS MORIO* PERCIFORMES, SERRANIDAE) ON THE COMECHE BANK.] *Rev. Cubana Invest. Pesq.* 5(1):38-45. 1980. In Spanish with English summ. SFA 29(1)
[Cent. Invest. Pesq., Havana, Cuba]

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

- 84-000768 Crooke, S. J. YELLOWTAIL, *SERIOLA LALANDEI* VALENCIENNES. *Calif. Coop. Oceanic Fish. Invest.* 24:84-87. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Calif. Dep. Fish Game, 245 W. Broadway, Long Beach 90802]
- 84-000769 FAO of the UN. RAPPORT DE LA SIXIÈME SESSION DU GROUPE DE TRAVAIL DE L'ÉVALUATION DES RESSOURCES. [REPORT OF THE SIXTH SESSION OF THE WORKING PARTY ON RESOURCE EVALUATION.] *FAO Fish. Rep.* No. 264. xiv + 147p. 1983. In English and French. SFA 29(1)
[Rome, Italy]
- 84-000770 Fawumi, J. S. COASTAL FISHERY MANAGEMENT IN NIGERIA: A BIOECONOMIC ANALYSIS OF THE BONNY ARTISANAL CANOE FISHERY. *Ph.D. dissertation, Mich. State Univ.* 155p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(6):1659. Dec. 1983. SFA 29(1)
- 84-000771 Hanan, D. A. BLUEFIN TUNA IN THE EASTERN NORTH PACIFIC OCEAN. *Calif. Coop. Oceanic Fish. Invest.* 24:97-98. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Calif. Dep. Fish Game, Southwest Fish. Cent., La Jolla 92038]
- 84-000772 International Council for the Exploration of the Sea. REPORTS OF THE ICES ADVISORY COMMITTEE ON FISHERY MANAGEMENT, 1982. *Int. Counc. Explor. Sea Coop. Res. Rep.* No. 119. iv + 473p. Mar. 1983. SFA 29(1)
[Palaegade 2-4, 1261 Copenhagen K, Denmark]
- 84-000773 Jones, V. J. FISHERIES FOR THE FUTURE. RESTRUCTURING THE GOVERNMENT-INDUSTRY PARTNERSHIP. NATIONAL OCEAN GOALS AND OBJECTIVES FOR THE 1980'S. *Natl. Advis. Comm. Oceans Atmos.* 67p. July 1982. From U.S. Government Reports 83(10):2137. 13 May 1983. Available from NTIS as PB83-151670. SFA 29(1)
- 84-000774 Klingbeil, R. A. PACIFIC MACKEREL: A RESURGENT RESOURCE AND FISHERY OF THE CALIFORNIA CURRENT. *Calif. Coop. Oceanic Fish. Invest.* 24:35-45. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Calif. Dep. Fish Game, Mar. Resour. Reg., 245 West Broadway, Long Beach 90802]
- 84-000775 Laurs, R. M. THE NORTH PACIFIC ALBACORE--AN IMPORTANT VISITOR TO CALIFORNIA CURRENT WATERS. *Calif. Coop. Oceanic Fish. Invest.* 24:99-106. Oct. 1983. In English with Spanish summ. SFA 29(1)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]
- 84-000776 Schultze, D. L. CALIFORNIA BARRACUDA LIFE HISTORY, FISHERIES, AND MANAGEMENT. *Calif. Coop. Oceanic Fish. Invest.* 24:88-96. Oct. 1983. In English with Spanish summ. SFA 29(1)
[Calif. Dep. Fish Game, Mar. Resour. Br., 1416 Ninth St., Sacramento 95814]
- 84-000777 Vojkovich, M. and R. J. Reed. WHITE SEABASS, *ATRACTOSCION NOBILIS*, IN CALIFORNIA-MEXICAN WATERS: STATUS OF THE FISHERY. *Calif. Coop. Oceanic Fish. Invest.* 24:79-83. Oct. 1983. In English with Spanish

SPORT FISHERY ABSTRACTS

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

84-000777 CONTINUED summ. SFA 29(1)
[Mar. Resour. Br., Calif. Dep. Fish Game, 1301 West 12th Street, Long Beach 90813]

UTILIZATION OF FISHERY PRODUCTS

84-000778 Nauen, C. E. COMPILATION OF LEGAL LIMITS FOR HAZARDOUS SUBSTANCES IN FISH AND FISHERY PRODUCTS. *FAO Fish. Circ.* No. 764. iii + 102p. Oct. 1983. SFA 29(1)
[FAO of the UN, Rome, Italy]

MISC. TECHNIQUES AND EQUIPMENT

84-000779 Cofer, L. M. and S. P. Malvestuto. CENTIMETER VS. INCH-GROUP MEASUREMENTS FOR DESCRIBING AGE AND SIZE COMPOSITION OF FISH POPULATIONS. *N. Am. J. Fish. Manage.* 3(4):445-450. 1983. SFA 29(1)
[Okla. Dep. Wildl. Conserv., Southwest Reg. Fish., Star Route B, Box 66-E, Lawton, OK 73501]

84-000780 Foote, K. G.; H. P. Knudsen and G. Vestnes. STANDARD CALIBRATION OF ECHO SOUNDERS AND INTEGRATORS WITH OPTIMAL COPPER SPHERES. *Fiskeridir. Skr. Ser. Havunders.* 17(8):335-346. 1983. SFA 29(1)
[Inst. Mar. Res., Bergen, Norway]

84-000781 Jones, D. H. PHOTOGRAPHIC TECHNIQUE FOR THE LIVE MASS-MEASUREMENT OF SMALL FISH. *Prog. Fish-Cult.* 45(3):158-161. July 1983. SFA 29(1)
[Inst. Terrestrial Ecol., 78 Craighall Rd., Edinburgh EH6 4RQ, Scotland]

84-000782 Tyus, H. M. FISH RADIOTELEMETRY: THEORY AND APPLICATION FOR HIGH CONDUCTIVITY RIVERS. *U.S. Fish Wildl. Serv. FWS/OBS-82/38.* 37p. July 1982. From U.S. Government Reports 83(12):2584. 10 June 1983. Available from NTIS as PB83-166058. SFA 29(1)

84-000783 Yudanov, K. I.; I. L. Kalikhman and V. N. Shabalin (eds.). [FISHERY HYDROACOUSTIC PROBLEMS.] *All-Union Res. Inst. Mar. Fish. Oceanogr. (USSR)* 155p. 1983. In Russian with English summ. A collection of papers.-- RS. SFA 29(1)
[VNIRO, Moscow, USSR]

REVIEWS, BIBLIOGRAPHIES, ETC.

84-000784 Thorson, L. C. FISHERY PUBLICATION INDEX, 1975-79. *NOAA Tech. Rep. NMFS Circ.* 437. iii + 117p. May 1981. SFA 29(1)
[NMFS, 1700 Westlake Ave. North, Room 336, Seattle, WA 98109]

AUTHOR INDEX

Abad, M. A.
 84-000656
 Abdu-Nabi, A. H.
 84-000464
 Abdun-Nur, D.
 84-000112
 Abel, P. D.
 84-000645
 Abernethy, C. S.
 84-000118
 Abilkasimova, T. A.
 84-000052
 Acero P., A.
 84-000486
 Ackerman, S.
 84-000311
 Adachi, S.
 84-000166
 Adam, H.
 84-000197
 Adams, J. R.
 84-000574
 Adcock, P. J.
 84-000113
 Adelman, I. R.
 84-000030
 Agrawal, S. J.
 84-000677
 Ahmad, T.
 84-000114
 Ahmed, A. T. A.
 84-000557
 Akiyama, T.
 84-000035
 Aksland, M.
 84-000375
 Akster, H. A.
 84-000053
 Aldridge, F. J.
 84-000022
 Alekseev, F. E.
 84-000115
 Alekseev, S. S.
 84-000059
 Alexander, G. R.
 84-000747
 84-000752
 Allard, L.
 84-000048
 Allen, E. J.
 84-000047
 Allen, G. H.
 84-000650
 Allendorf, F. W.
 84-000296
 Almendras, J. M. E.
 84-000017
 Altukhov, Y. P.
 84-000281
 Alva, H. R.
 84-000019
 Alvarez, M. C.
 84-000316
 Alvheim, O.
 84-000373
 84-000374
 Ambak, M. A.
 84-000479
 Ambrose, D. A.
 84-000054
 84-000094
 Amend, D. F.
 84-000563
 Amin, O. M.
 84-000569
 Anderson, C. S.
 84-000339
 Anderson, D. P.
 84-000269
 Anderson, O.
 84-000424
 Anderson, W. D., Jr.
 84-000522
 Andreyeva, A. M.
 84-000116
 Angus, R. A.
 84-000632
 Annand, M. C.
 84-000299
 Apple, L. L.
 84-000748
 Applegate, R. L.
 84-000455
 Arai, S.
 84-000037
 Ardill, J. D.
 84-000765
 Aref'ev, V. A.
 84-000282
 Arimoto, T.
 84-000716
 Arnett, G. R.
 84-000684
 Aronov, M. P.
 84-000728
 Arthington, A. H.
 84-000359
 Attardo, L.
 84-000328
 Austin, M. R.
 84-000757
 Autefage, A.
 84-000648
 Badawi, H. K.
 84-000654
 84-000655
 Bagarinao, T.
 84-000425
 Bailey, C. F.
 84-000055
 Baker, B. I.
 84-000117
 Baker, J. A.
 84-000504
 Bakthavathsalam, R.
 84-000633

- Balasubramanian, N. K.
 84-000436
 Ball, J. N.
 84-000278
 Balon, E. K.
 84-000283
 84-000480
 Balsano, J. S.
 84-000215
 84-000318
 Bams, R. A.
 84-000007
 Banno, K.
 84-000331
 Bar-El, T.
 84-000168
 Barash, H.
 84-000011
 Barber, R. T.
 84-000498
 84-000592
 Barekryan, A. S.
 84-000343
 Barlow, G. W.
 84-000322
 Barsukov, V. V.
 84-000511
 Bartell, S. M.
 84-000473
 Bartos, J. M.
 84-000637
 Bauer, B. H.
 84-000286
 Bayne, D. R.
 84-000713
 Beacham, T. D.
 84-000056
 Beamish, R. J.
 84-000358
 84-000465
 Beck, M. L.
 84-000284
 Becker, C. D.
 84-000118
 Bedford, D. W.
 84-000344
 84-000766
 Beeton, A. M.
 84-000005
 Bemis, W. E.
 84-000426
 Benjamin, M.
 84-000057
 Benson, W. H.
 84-000635
 Benyumov, A. O.
 84-000192
 Bergersen, E.
 84-000705
 Bergheim, A.
 84-000593
 Bergstedt, R. A.
 84-000481
 Bern, H. A.
 84-000098
 84-000153
 84-000154
 Bernstein, J. W.
 84-000427
 Berry, E. S.
 84-000564
 Bhattacharya, S.
 84-000234
 Biddinger, G. R.
 84-000634
 Biddiscombe, S.
 84-000119
 Bidleman, T. F.
 84-000651
 Biggers, C. J.
 84-000284
 Bilgrami, K. S.
 84-000749
 Bills, T. D.
 84-000711
 Birdsong, R. S.
 84-000311
 Birge, W. J.
 84-000635
 Blaber, A.
 84-000133
 Black, G. A.
 84-000570
 Black, J. A.
 84-000635
 Blacker, R. W.
 84-000415
 Blanc, J. M.
 84-000431
 Blanco, W.
 84-000767
 Blaylock, J. W.
 84-000649
 Block, B. A.
 84-000120
 Bobak, P.
 84-000313
 Boehlert, G. W.
 84-000458
 Boese, B. L.
 84-000669
 Bohnsack, J. A.
 84-000710
 Bok, A. H.
 84-000012
 Bomermuth, R. B.
 84-000483
 Bond, C. E.
 84-000371
 Bone, Q.
 84-000058
 Bonnemaision, P.
 84-000648
 Boord, R. L.
 84-000121
 Borets, L. A.
 84-000511

- Borisovets, E. E.
 84-000059
 Boudou, A.
 84-000636
 Bowman, R. E.
 84-000443
 Bowser, P. R.
 84-000013
 Boyd, R. B.
 84-000122
 Bozhkova, V. P.
 84-000123
 84-000124
 Brabant, J.
 84-000717
 Bradbury, M. W. B.
 84-000134
 Braun, H. E.
 84-000606
 Breck, J. E.
 84-000473
 84-000509
 84-000611
 84-000628
 Brewer, G. D.
 84-000381
 Brewer, S. D.
 84-000258
 Brooks, A. S.
 84-000637
 Brooks, G. R., Jr.
 84-000336
 Brooks, W. R.
 84-000323
 Brown, D. A.
 84-000602
 Brown, D. C.
 84-000285
 Brown, G. M., Jr.
 84-000594
 Brown, J.
 84-000229
 Brown, J. A.
 84-000428
 Brown, L.
 84-000325
 Brown, L. N.
 84-000002
 Browning, J.
 84-000068
 Buck, R. J. G.
 84-000423
 Bucke, E.
 84-000540
 Buckingham, J. C.
 84-000117
 Buckley, J. A.
 84-000638
 Buikema, A. L., Jr.
 84-000644
 Bulger, A. J.
 84-000125
 Bulger, A. J., Jr.
 84-000763
 Bullock, A. M.
 84-000673
 Bullock, J.
 84-000228
 Burdick, C. J.
 84-000231
 Burge, H.
 84-000407
 Burke, J.
 84-000565
 Burke, J. M.
 84-000483
 Burke, M.
 84-000126
 Burke, P. M.
 84-000639
 Burkhead, N. M.
 84-000286
 Burr, B. M.
 84-000391
 Burt, M. D. B.
 84-000583
 Burton, D. T.
 84-000604
 84-000640
 Burton, L.
 84-000685
 Busby, M. S.
 84-000094
 Butler, J. L.
 84-000054
 84-000094
 Butts, D. E.
 84-000172
 Cadwallader, P. L.
 84-000714
 Cailliet, G. M.
 84-000344
 Cairns, J., Jr.
 84-000644
 Cairns, V.
 84-000243
 Callard, G. V.
 84-000209
 84-000230
 Callard, I. P.
 84-000263
 Cameron, A. M.
 84-000127
 84-000128
 Campbell, K. P.
 84-000595
 Canton, S. P.
 84-000596
 Carlson, C. A.
 84-000760
 Carroll, J. H.
 84-000608
 Carter, R. R.
 84-000025
 Carter, T. V.
 84-000651
 Casey, J. G.
 84-000471

- Cassidy, S.
 84-000129
 Castren, M.
 84-000111
 Cazieux, A.
 84-000648
 Cedillo, R.
 84-000429
 Cenini, P.
 84-000641
 Cerri, R. D.
 84-000430
 Chadwick, J. W.
 84-000596
 Chailakhyan, L. M.
 84-000123
 84-000124
 Chalk, D. E.
 84-000382
 Chambolle, P.
 84-000186
 84-000187
 Chang, J. P.
 84-000023
 84-000130
 Chang, K.
 84-000681
 Charles, A. T.
 84-000733
 84-000734
 Charlon, N.
 84-000431
 Chartock, M. A.
 84-000432
 Chauvet, E.
 84-000750
 Chavez, F. P.
 84-000498
 Chervinski, J.
 84-000060
 Chiaureli, N. B.
 84-000256
 84-000314
 Childers, W. F.
 84-000305
 Chin, H.
 84-000328
 Chiu, K. W.
 84-000277
 Cho, C. Y.
 84-000618
 Chourrout, D.
 84-000287
 Chow, C. L.
 84-000277
 Christensen, S. W.
 84-000376
 Chulitskaya, E. V.
 84-000139
 Chunyuan, W.
 84-000512
 Clancy, K. M.
 84-000543
- Claridge, P. N.
 84-000345
 Clark, J. E.
 84-000735
 Claxton, M. J.
 84-000551
 Coelho, M. M.
 84-000288
 Cofer, L. M.
 84-000779
 Cohen, J. E.
 84-000376
 Coleman, M.
 84-000407
 Collares-Pereira, M. J.
 84-000288
 Collette, B. B.
 84-000513
 84-000514
 Collie, J. S.
 84-000736
 Collier, N.
 84-000013
 Collvin, L.
 84-000642
 Colorni, A.
 84-000549
 Colville, T. P.
 84-000131
 Compagno, L. J. V.
 84-000515
 Cook, R. C.
 84-000377
 Copeland, B. J.
 84-000762
 Corazza, L.
 84-000132
 Cordes, L. E.
 84-000530
 Crabtree, R. E.
 84-000516
 Craig, T.
 84-000133
 Crateau, E. J.
 84-000372
 Crawford, T.
 84-000346
 Crim, L. W.
 84-000008
 84-000023
 Crooke, S. J.
 84-000768
 Cross, F. B.
 84-000482
 84-000490
 Crozier, C. D.
 84-000518
 Cryer, A.
 84-000680
 Cserr, H. F.
 84-000134
 Curtis, L. R.
 84-000135

Da Costa, H.
 84-000643
 Dando, P. R.
 84-000113
 Danos, P. T.
 84-000637
 Darcy, G. H.
 84-000347
 84-000348
 Datta Munshi, J. S.
 84-000749
 Davidson, J. R.
 84-000005
 Davis, J. A.
 84-000760
 Davis, J. F.
 84-000550
 Davison, W.
 84-000143
 Dawley, R. M.
 84-000289
 Day, R. E.
 84-000757
 Daye, P. G.
 84-000601
 de Oliveria Malta, J. C.
 84-000571
 84-000572
 De Silva, S. S.
 84-000136
 Dea, S.
 84-000566
 Dean, J. C.
 84-000031
 Dean, J. M.
 84-000439
 DeAngelis, D. L.
 84-000509
 84-000737
 Deguchi, Y.
 84-000257
 Delerue-Le Belle, N.
 84-000142
 DeLuca, D.
 84-000269
 DeManno, D. A.
 84-000137
 Demartini, E. E.
 84-000454
 Dempsey, D. M. O.
 84-000395
 Demski, L. S.
 84-000392
 Denoncourt, R. F.
 84-000483
 Desrochers, P. E.
 84-000138
 Dettlaff, T. A.
 84-000139
 DeVries, A. L.
 84-000122
 Dickhoff, W. W.
 84-000234

...CONTINUED...

Dickhoff, W. W.
 84-000258
 DiMichele, L.
 84-000203
 Do, T. T.
 84-000577
 Doane, T. R.
 84-000644
 Dobbie, J. W.
 84-000131
 Dojiri, M.
 84-000573
 Dominey, W. J.
 84-000324
 Dommasnes, A.
 84-000373
 84-000374
 Donald, E. L.
 84-000235
 Donald, J. A.
 84-000061
 Donnelly, R. F.
 84-000499
 Dores, R. M.
 84-000140
 Dorosheva, M. G.
 84-000141
 Dosanjh, B. S.
 84-000028
 Douglas, M. E.
 84-000484
 Downey, P.
 84-000416
 Downhower, J. F.
 84-000325
 Drewett, N.
 84-000645
 Du Toit, R. F.
 84-000694
 Dubois, M. P.
 84-000187
 Dubourg, P.
 84-000187
 Ducker, G.
 84-000330
 Duffield, D. J.
 84-000016
 Dufour, S.
 84-000142
 Dulka, J. G.
 84-000392
 Dun, Z.
 84-000294
 Dunn, I. J.
 84-000574
 Dunn, J. F.
 84-000143
 Dunn, J. R.
 84-000517
 Dunn, W. H.
 84-000752
 Duray, M. N.
 84-000017

- Duray, V. M.
 84-000017
 Dutta, H. M.
 84-000062
 Dwyer, W. P.
 84-000254
 84-000466
 Dyer, M. F.
 84-000500
 Easley, J. E., Jr.
 84-000762
 Echelle, A. A.
 84-000518
 Echelle, A. F.
 84-000518
 Eck, G. W.
 84-000349
 Eddy, F. B.
 84-000184
 Edsall, T. A.
 84-000395
 Edwards, C. A.
 84-000041
 Edwards, E. A.
 84-000695
 84-000696
 Eilers, J. M.
 84-000597
 El-Sayed, N.
 84-000100
 Elazhary, M. A. S. Y.
 84-000566
 Eldon, G. A.
 84-000459
 Ellis, A. E.
 84-000556
 Ellis, A. G.
 84-000061
 Emmerson, W. D.
 84-000144
 Endean, R.
 84-000204
 Englert, J.
 84-000326
 84-000501
 Erickson, C. A.
 84-000107
 Esch, G. W.
 84-000576
 84-000578
 Evans, D. M.
 84-000008
 Fadeev, N. S.
 84-000096
 Fagerlund, U. H. M.
 84-000028
 Fairfax, S.
 84-000685
 Fajer, E.
 84-000646
 Falls, W. W.
 84-000013
 Fancey, L. L.
 84-000683
 Fange, R.
 84-000207
 FAO of the UN
 84-000003
 84-000004
 84-000598
 84-000599
 84-000769
 Fatimah, M. Y.
 84-000479
 Fawumi, J. S.
 84-000770
 Fayolle, P.
 84-000648
 Featherstone, P. B.
 84-000040
 Feist, S. W.
 84-000540
 Felley, J.
 84-000291
 Ferguson, H. W.
 84-000551
 Feulgenhauer, P. E.
 84-000139
 Fiantdt, J. T.
 84-000682
 Fiedler, P. C.
 84-000393
 Field-Dodgson, M. S.
 84-000718
 Figueroa, L.
 84-000589
 Findley, L. T.
 84-000519
 Fine, M. L.
 84-000327
 84-000338
 Finger, T. E.
 84-000140
 Fink, W. L.
 84-000537
 Fish, P. A.
 84-000342
 Fisher, A. W. F.
 84-000145
 Flagg, T. A.
 84-000667
 Flickinger, S. A.
 84-000029
 Focant, B.
 84-000146
 Focesi, A., Jr.
 84-000235
 Foggin, G. T. III
 84-000600
 Fogle, B.
 84-000586
 Fontaine, Y.
 84-000142
 Foote, K. G.
 84-000780
 Forest, C. L.
 84-000104

AUTHOR INDEX

Fossum, P.
84-000147

Foster, G. D.
84-000267

Fournie, J. W.
84-000558

Francis, R. C.
84-000378

Franjola, R.
84-000589

Frechette, J.
84-000496

Freeman, H. C.
84-000601

French, C. J.
84-000148

Friese, U. E.
84-000647

Frizzell, R. A.
84-000273

Frost, K. J.
84-000485

Fry, P. D.
84-000500

Fukayama, S.
84-000063

Fukuda, H.
84-000568

Fukuda, Y.
84-000319

Fukuhara, O.
84-000064

Fulcher, A. S.
84-000065

Furutani, A.
84-000622

Fuss, J. T.
84-000046

Gabliks, J.
84-000564

Gaither, W. S.
84-000005

Gajdusek, J.
84-000066
84-000067

Galbraith, R. D.
84-000719

Gallucci, V. F.
84-000594

Gannon, B. J.
84-000068

Garcia, C.
84-000720

Garcia, M. A.
84-000447

Garman, G. C.
84-000379

Garrett, R. N.
84-000421

Garrick, J. A. F.
84-000515

Garside, E. T.
84-000601

Garzon F., J.
84-000486

Gasser, K. W.
84-000149

Gaudin, A. J.
84-000093

Gebhart, G.
84-000367
84-000696

Geevarghese, C.
84-000069
84-000394

Geffen, A. J.
84-000070

Geiger, J. G.
84-000027

Genevois, J. P.
84-000648

Gershanovich, A. D.
84-000150

Gery, J.
84-000526

Gibson, C. I.
84-000649

Gibson, R. N.
84-000434

Giles, N.
84-000575

Gill, H. S.
84-000270

Gill, V.
84-000145

Gilmartin, M.
84-000005

Gjedrem, T.
84-000290

Gjerde, B.
84-000290

Glandt, D.
84-000433

Glass, G. E.
84-000597

Gloss, S. P.
84-000730

Gold, M. R.
84-000140

Goldspink, G.
84-000206

Gonzalez, I.
84-000151

Goodyear, C. D.
84-000395

Goodyear, C. P.
84-000376

Goolish, E. M.
84-000030

Goos, H. J. T.
84-000157

Gorbman, A.
84-000071
84-000234

Gordon, M. S.
84-000328

AUTHOR INDEX

Gorman, O. T.
84-000482

Gossett, R. W.
84-000602

Goswami, S. V.
84-000152

Goto, A.
84-000488

Gots, B. L.
84-000357

Gould, R. W.
84-000272

Grabner, M.
84-000089

Grabowski, S. J.
84-000711

Grace, T. B.
84-000700

Graham, J. H.
84-000291

Graham, R. J.
84-000467

Granath, W. O., Jr.
84-000576

Grau, E. G.
84-000153
84-000154

Graves, J. E.
84-000292

Graves, W. C.
84-000604

Greeley, M. S., Jr.
84-000072

Green, J. M.
84-000683

Greenspan, J. A.
84-000301

Grier, H. J.
84-000241
84-000396

Grigor'ev, S. S.
84-000350

Grizzle, J. M.
84-000603
84-000662

Gross, T.
84-000153

Grove, B. D.
84-000155

Grudzien, T. A.
84-000520

Guppy, M.
84-000143

Haaster, J. V.
84-000040

Habibi, H. R.
84-000156

Hager, M. C.
84-000763

Hagerman, F. B.
84-000766

Hall, L. W., Jr.
84-000604

...CONTINUED...

Hall, L. W., Jr.
84-000640

Hallett, F. R.
84-000133

Halpern-Sebold, L.
84-000210

Halpern-Sebold, L. R.
84-000157
84-000248

Hamada, A.
84-000158
84-000159

Hamada, K.
84-000488

Hamilton, C. K.
84-000690

Hamlett, W. C., Jr.
84-000160

Hamley, J. M.
84-000380

Hammer, C.
84-000721

Hanan, D. A.
84-000771

Hanel, L.
84-000073

Hanlon, R. T.
84-000329

Hannon, E. H.
84-000732

Hansen, D. J.
84-000751

Hansen, E. A.
84-000747
84-000752

Hansen, P. S.
84-000609

Harada, M.
84-000276

Harader, R. R., Jr.
84-000650

Harder, H. W.
84-000651

Hardy, A.
84-000237

Hardy, G. S.
84-000521

Harrington, J. P.
84-000161

Harris, C.
84-000705

Harris, L. E.
84-000457

Harrison, F. L.
84-000652

Hartmann, J.
84-000605

Harvey, B.
84-000014

Haschemeyer, A. E. V.
84-000162

Hashem, M. T.
84-000351

AUTHOR INDEX

Hashimoto, K.
 84-000194
 Haslouer, S. G.
 84-000482
 84-000630
 Hawkes, C. L.
 84-000382
 Hawkes, J. W.
 84-000106
 Hawkins, W. E.
 84-000558
 Hay, D. W.
 84-000423
 Hayasaka, S. S.
 84-000550
 Hayashi, K.
 84-000163
 Hayton, W. L.
 84-000653
 Hedrick, R. P.
 84-000563
 Heemstra, P. C.
 84-000522
 Heidinger, R. C.
 84-000391
 Helfrich, L. A.
 84-000031
 84-000452
 Hendricks, J. D.
 84-000580
 84-000665
 Hendricks, M. L.
 84-000487
 Henrichfreise, G.
 84-000330
 Herrmann, J.
 84-000164
 Hewitt, R. P.
 84-000381
 84-000385
 Hidaka, H.
 84-000625
 Higgs, D. A.
 84-000028
 Hilmy, A. M.
 84-000654
 84-000655
 Hilton, J. W.
 84-000032
 84-000606
 Hirano, T.
 84-000165
 Hirasawa, Y.
 84-000035
 Hirose, K.
 84-000166
 Hixon, R. F.
 84-000329
 Hjelmeland, K.
 84-000167
 Ho, J.
 84-000577
 Hochachka, P. W.
 84-000143

...CONTINUED...
 Hochachka, P. W.
 84-000148
 Hocutt, C. H.
 84-000487
 Hodson, P. V.
 84-000606
 Hodson, R. G.
 84-000762
 Hoekstra, T. W.
 84-000382
 Hofer, R.
 84-000089
 Hoffert, J. R.
 84-000138
 Hoffman, S. G.
 84-000352
 Hofsten, A. v.
 84-000168
 Hokama, Y.
 84-000656
 Holcombe, G. W.
 84-000682
 Holdway, D. A.
 84-000169
 Holmes, K.
 84-000228
 Holmes, R. A.
 84-000434
 Holmgren, S.
 84-000220
 Holstein, B.
 84-000170
 Holt, G. J.
 84-000631
 Holt, S. A.
 84-000631
 Holtzman, S.
 84-000129
 Hontela, A.
 84-000171
 Hord, H. H. V.
 84-000620
 Hosford, W. E.
 84-000353
 Hossain, A.
 84-000062
 Houle, C. R.
 84-000043
 Housley, G. D.
 84-000074
 84-000092
 Howell, W. M.
 84-000172
 Howes, G. J.
 84-000075
 Howley, T. P.
 84-000380
 Hubbert, R. M.
 84-000033
 Hubert, W. A.
 84-000758
 Huckins, J. N.
 84-000607

- Hughes, A. L.
 84-000397
 Hughes, M. G.
 84-000240
 Hughes, S. G.
 84-000034
 Hulata, G.
 84-000024
 Hung, S. S. O.
 84-000173
 Hunter, J. R.
 84-000425
 Hunter, R. G.
 84-000608
 Huriaux, F.
 84-000146
 Husby, D. M.
 84-000050
 Hussain, N. A.
 84-000114
 Hustveit, H.
 84-000593
 Hutchins, M. L.
 84-000738
 Hutson, P. L.
 84-000015
 Idler, D. R.
 84-000119
 Iga, T.
 84-000174
 Ignat'eva, G. M.
 84-000175
 84-000176
 Iijima, N.
 84-000177
 Imai, T.
 84-000722
 Ince, B. W.
 84-000156
 Ingebrigtsen, K.
 84-000657
 Inoue, Y.
 84-000716
 International Council for the Exploration
 of the Sea
 84-000049
 84-000772
 Irish, F. J.
 84-000435
 Isaacks, R. E.
 84-000178
 Ishihara, S.
 84-000552
 Ishino, K.
 84-000488
 Ita, E. O.
 84-000761
 Ito, F.
 84-000076
 Ito, H.
 84-000077
 Iwamatsu, T.
 84-000078
- ...CONTINUED...
 Iwamatsu, T.
 84-000179
 84-000320
 Iwan, G. R.
 84-000354
 Iwasaki, J.
 84-000159
 Iwata, M.
 84-000461
 Iyama, S.
 84-000315
 Jackson, A. J.
 84-000040
 Jacob, S. S.
 84-000436
 Jacob, W. F.
 84-000180
 Jacobs, K. E.
 84-000383
 Jannasch, H. W.
 84-000162
 Jenkins, S. H.
 84-000609
 Jennings, F. D.
 84-000005
 Jensen, R.
 84-000658
 Jewett, S. L.
 84-000523
 Jiashen, Z.
 84-000293
 Jobling, M.
 84-000181
 84-000182
 84-000437
 Johansson, J.
 84-000341
 John, P. A.
 84-000069
 84-000394
 Johnson, H. E.
 84-000016
 Johnson, J. E.
 84-000183
 Johnson, L.
 84-000610
 Johnson, S. R.
 84-000595
 Johnston, A. D.
 84-000417
 Johnston, G. P.
 84-000258
 Johnston, I. A.
 84-000184
 Johnstone, R.
 84-000185
 Jolliff, T.
 84-000712
 Jones, D. H.
 84-000781
 Jones, K.
 84-000673
 Jones, V. J.
 84-000773

AUTHOR INDEX

Jongbloed, H.
 84-000012
 Jordan, S. W.
 84-000706
 Jorgenson, T. A.
 84-000664
 Juario, J. V.
 84-000017
 Jude, D. J.
 84-000419
 Junbao, S.
 84-000293
 Kafiani, C. A.
 84-000314
 Kah, O.
 84-000186
 84-000187
 Kahan, D.
 84-000168
 Kalikhman, I. L.
 84-000783
 Kalish, J.
 84-000341
 Kanciruk, P.
 84-000611
 84-000628
 Kaneko, F.
 84-000568
 Kang, L.
 84-000294
 Karabanova, O. I.
 84-000188
 Karlsson, L.
 84-000079
 Karnella, C.
 84-000355
 Kartavtsev, Y. P.
 84-000295
 Kasahara, S.
 84-000577
 Kashapova, L. A.
 84-000095
 Kashimoto, T.
 84-000629
 Kastner, R.
 84-000275
 Kato, T.
 84-000319
 Katznelson, R.
 84-000168
 Kaufman, L. S.
 84-000080
 84-000086
 Kawamura, G.
 84-000331
 Kay, J.
 84-000680
 Kayama, M.
 84-000177
 Keegan-Rogers, V.
 84-000189
 Keenleyside, M. H. A.
 84-000398
 Kehoe, D. M.
 84-000659
 Keller, N. E.
 84-000228
 Kelley, R. N.
 84-000014
 Kelso, W. E.
 84-000438
 Kemp, A.
 84-000081
 Kenchington, T. J.
 84-000299
 Kerby, J. H.
 84-000585
 Kerr, K.
 84-000040
 Kesbeke, F.
 84-000264
 Khachaturov, V. A.
 84-000082
 Khariton, V. Y.
 84-000123
 Khudenko, G. V.
 84-000083
 Kiceniuk, J. W.
 84-000683
 Kiessling, A.
 84-000660
 Kim, H. D.
 84-000178
 Kimura, T.
 84-000553
 King, D. L.
 84-000692
 Kirchgessner, M.
 84-000280
 Kirschner, L. B.
 84-000149
 Kitchell, J. F.
 84-000473
 Kittelsen, A.
 84-000593
 Klauda, R. J.
 84-000640
 Kleckner, R. C.
 84-000399
 Kleypas, J.
 84-000439
 Klingbeil, R. A.
 84-000774
 Klumpp, D. W.
 84-000440
 Klyachko, O. S.
 84-000190
 84-000191
 Knapp, W. E.
 84-000730
 Knudsen, H. P.
 84-000780
 Knudsen, J.
 84-000658
 Knudsen, K. L.
 84-000296

- Knyazeva, E. F.
 84-000192
 Koban, M.
 84-000193
 Kodama, M.
 84-000194
 Kodolova, O. P.
 84-000297
 Kodric-Brown, A.
 84-000400
 Koester, D. M.
 84-000084
 Koizumi, C.
 84-000227
 Kokes, J.
 84-000441
 Koltes, K. H.
 84-000332
 Komura, L. H.
 84-000656
 Konchina, Y. V.
 84-000442
 Kononov, Y. D.
 84-000195
 Korzh, V. P.
 84-000196
 Kosmath, I.
 84-000197
 Kostomarova, A. A.
 84-000192
 Kottelat, M.
 84-000524
 84-000533
 Kozlov, A. N.
 84-000198
 Kranz, H.
 84-000582
 Kratochvil, H.
 84-000333
 Krieger, D.
 84-000715
 Krohn, W. B.
 84-000690
 Krupp, F.
 84-000536
 Kumagai, H.
 84-000612
 Kumamaru, A.
 84-000159
 Kumar, D.
 84-000581
 Kumaraguru, A. K.
 84-000661
 Kuntsova, M. Y.
 84-000083
 Kuroda, N.
 84-000368
 Kurz-Isler, G.
 84-000275
 Kusuda, R.
 84-000552
 Kutty, M. N.
 84-000671
- Kynard, B.
 84-000730
 Lacey, S. M.
 84-000559
 Lachner, E. A.
 84-000523
 Laevastu, T.
 84-000686
 Laitinen, M.
 84-000668
 Lam, C. N. H.
 84-000007
 Lane, E. B.
 84-000109
 Langdon, J. S.
 84-000199
 Langille, R. M.
 84-000200
 Langton, R. W.
 84-000443
 Lanza, J.
 84-000201
 84-000334
 Lapkin, V. V.
 84-000202
 Lariviere-Durand, C.
 84-000567
 Lauder, G. V.
 84-000085
 84-000426
 Laurs, R. M.
 84-000775
 Law, R. J.
 84-000500
 Lazarovici, P.
 84-000236
 Le Bras, Y. M.
 84-000232
 Leary, R. F.
 84-000296
 Leatherland, J. F.
 84-000126
 Leatherland, J. L.
 84-000606
 Lederis, K.
 84-000145
 Lee, E.
 84-000203
 Leggett, H. G.
 84-000026
 84-000613
 Leloup-Hatey, J.
 84-000237
 Lemly, A. D.
 84-000578
 Lenhardt, M. L.
 84-000327
 Leonard, R. B.
 84-000240
 Leong, I.
 84-000218
 Leroy, R.
 84-000463

AUTHOR INDEX

Leslie, A. J., Jr.
 84-000001
 Lester, R. J. G.
 84-000068
 Levadnyi, V. D.
 84-000095
 Lewis, R. J.
 84-000127
 84-000128
 84-000204
 Lewis, S. M.
 84-000444
 Libosvarsky, J.
 84-000468
 84-000469
 Lied, E.
 84-000205
 Liehman, P.
 84-000307
 Liem, K. F.
 84-000086
 Limsuwan, C.
 84-000662
 Limsuwan, T.
 84-000662
 Lindahl-Kiessling, K.
 84-000660
 Lindall, W. N., Jr.
 84-000764
 Lippincott, B. L.
 84-000723
 Lipscomb, J. F.
 84-000690
 Livingston, C. A.
 84-000240
 Llewellyn, J.
 84-000579
 Lock, R. A. C.
 84-000110
 Loeb, V. J.
 84-000489
 84-000502
 Logvinenko, B. M.
 84-000297
 Lombardi, J.
 84-000087
 84-000239
 Long, W. L.
 84-000088
 Losey, G. S., Jr.
 84-000335
 Loughna, P. T.
 84-000206
 Lowe-Jinde, L.
 84-000560
 Lowik, C. J. M.
 84-000274
 Lowry, L. F.
 84-000485
 Lund, B.
 84-000205
 Lundblad, G.
 84-000207
 Lyle, J. M.
 84-000445
 Lynch, T. J.
 84-000584
 MacCall, A. D.
 84-000356
 MacCrimmon, H. R.
 84-000357
 84-000414
 Mace, J. T.
 84-000417
 Mace, P. M.
 84-000446
 MacGregor, J. S.
 84-000470
 MacGregor, R. III
 84-000072
 Macintosh, D. J.
 84-000185
 Mackie, K.
 84-000134
 Maeda, W.
 84-000158
 84-000159
 Maemura, S.
 84-000208
 Magurran, A. E.
 84-000453
 Mahr, K.
 84-000089
 Main, J.
 84-000724
 Mak, P.
 84-000209
 Maler, L.
 84-000246
 Malmqvist
 84-000384
 Maloiy, G. M. O.
 84-000184
 Malvestuto, S. P.
 84-000779
 Mamontov, A. M.
 84-000295
 Mandis, T.
 84-000457
 Marasco, R. J.
 84-000745
 Marcus, C. S.
 84-000112
 Margolis-Kazan, H.
 84-000157
 84-000210
 84-000248
 Margrey, S. L.
 84-000604
 84-000640
 Marion, K. R.
 84-000072
 Mariscal, R. N.
 84-000323
 Marking, L. L.
 84-000711

AUTHOR INDEX

Markle, D. F.
84-000525

Marsh, A.
84-000448

Marsh, A. C.
84-000365

Marsh, B. A.
84-000365

Marshall, N. B.
84-000058

Martin, M. G.
84-000614

Martinez, A. P.
84-000361

Martinsen, O.
84-000373
84-000374

Maruyama, J.
84-000194

Mason, J. C.
84-000358

Matheson, R. E., Jr.
84-000336

Mathur, D.
84-000337

Matlock, G. C.
84-000447
84-000707
84-000708

Matsumoto, W. M.
84-000699

Maughan, O. E.
84-000367
84-000696

Mayden, R. L.
84-000490

Mayhew, D. A.
84-000298

McAdoo, D. J.
84-000240

McBride, D. N.
84-000390

McBride, J. R.
84-000028

McCallum, I.
84-000028

McCarl, B. A.
84-000739

McCarter, J. A.
84-000674
84-000675

McCleave, J. C.
84-000399

McClelland, B. R.
84-000600

McCormick, C. A.
84-000090

McCormick, S. D.
84-000211

McDowell, T.
84-000563

McEachron, L. W.
84-000708

McFall-Ngai, M. J.
84-000212

McFarlane, G. A.
84-000358
84-000465

McGlade, J. M.
84-000299

McKaye, K. R.
84-000448

McKenzie, D. H.
84-000615

McLain, D. R.
84-000503

McLaren, I. A.
84-000474

McMahon, T. E.
84-000697

Meade, J. W.
84-000046

Meinke, D. K.
84-000091

Melius, P.
84-000603

Menezes, M. R.
84-000663

Menezes, N. A.
84-000526

Merrett, N. R.
84-000527

Merritt, M. F.
84-000401

Messamer, R. K.
84-000009

Meyer, F. P.
84-000664

Meyer, J. H.
84-000213

Meyers, T. R.
84-000580
84-000665

Mi, Z.
84-000294

Michnovicz, J. J.
84-000214

Miller, D. L.
84-000491

Miller, G. L.
84-000449

Miller, L. W.
84-000508

Miller, R. R.
84-000528

Miller, S. A.
84-000382

Milton, D. A.
84-000359

Mina, M. V.
84-000059

Minghua, L.
84-000293

Minter, D. W.
84-000556

Mishra, B. K.
84-000581

AUTHOR INDEX

- Mitchell, C. B.
84-000046
- Mitsuoka, R. R.
84-000693
- Mittelbach, G. G.
84-000740
- Miura, T.
84-000725
- Moccia, R. D.
84-000551
- Mohsin, A. K. M.
84-000479
- Moles, A.
84-000541
- Mollah, M. F. A.
84-000018
- Moller, D.
84-000463
- Mommsen, T. P.
84-000148
- Monaco, P. J.
84-000215
84-000318
- Montgomery, J. C.
84-000074
84-000092
- Moody, E. J.
84-000134
- Moon, T. W.
84-000267
- Morgan, R. P.
84-000679
- Morgan, R. P. II
84-000300
- Morgan, W. L.
84-000450
- Moriarty, C.
84-000360
- Morizot, D. C.
84-000301
- Mork, J.
84-000302
- Morris, B. F.
84-000698
- Morris, S. L.
84-000093
- Mosca, P. J.
84-000338
- Moscoso, J. C.
84-000019
- Moser, H.
84-000089
- Moser, H. G.
84-000054
84-000094
84-000489
84-000502
- Mosher, T. D.
84-000759
- Moshkov, D. A.
84-000095
- Moss, G. D.
84-000395
- Moss, R. E.
84-000339
- Motta, P. J.
84-000451
- Mourik, J.
84-000216
84-000217
- Moyer, J. T.
84-000409
- Mpoame, M.
84-000542
- Mulcahy, D.
84-000565
- Mullebner, M.
84-000333
- Munther, G. L.
84-000753
- Murai, T.
84-000035
84-000226
- Muramoto, S.
84-000666
- Murofushi, M.
84-000303
84-000304
- Murray, C. B.
84-000056
- Mutton, B.
84-000726
- Muzafarova, L. N.
84-000095
- Mytsul, V. F.
84-000728
- Nacario, J. F.
84-000017
- Naevdal, G.
84-000463
- Nagahama, Y.
84-000166
84-000279
- Nahorniak, C. S.
84-000023
- Nair, M. S. R.
84-000218
- Nair, N. B.
84-000436
- Nall, L. E.
84-000001
- Nauen, C. E.
84-000778
- Nayar, M. S. B.
84-000218
- Nedelec, C.
84-000717
- Neifakh, A. A.
84-000190
84-000191
- Neil, S. J.
84-000402
84-000403
- Neitzel, D. A.
84-000118
- Nelson, C. S.
84-000050

- Nelson, D. W.
 84-000529
 Nelson, P. C.
 84-000701
 84-000702
 Nero, R. W.
 84-000616
 Nesheim, M. C.
 84-000034
 Neth, P. C.
 84-000712
 Neves, R. J.
 84-000370
 Newcomb, T. W.
 84-000667
 Ney, J. J.
 84-000438
 84-000614
 84-000617
 Nicholas, J. W.
 84-000418
 Nichols, P. D.
 84-000440
 Nickum, J. G.
 84-000132
 Nielsen, D. V.
 84-000422
 Nielsen, L. A.
 84-000031
 Nieminen, M.
 84-000668
 Niimi, A. J.
 84-000560
 84-000618
 Nikiforov, S. N.
 84-000096
 Nikitina, L. A.
 84-000219
 Nilsen, W. H.
 84-000452
 Nilsson, S.
 84-000220
 Nirmala, J.
 84-000671
 Nishikawa, S.
 84-000303
 84-000304
 Nishioka, R. S.
 84-000098
 84-000153
 84-000154
 Niu, L. C.
 84-000221
 Niu, M. C.
 84-000221
 Niwa, M.
 84-000276
 Noeske, T. A.
 84-000036
 84-000222
 Noguchi, T.
 84-000194
 Noonan, K. C.
 84-000404
- Nordlie, F. G.
 84-000223
 Norman, D.
 84-000057
 Northcutt, R. G.
 84-000121
 Norton, M. G.
 84-000540
 Nose, T.
 84-000035
 84-000037
 84-000226
 Nose, Y.
 84-000368
 Novak, J.
 84-000073
 Nriagu, J. O.
 84-000224
 O'Grady, S. M.
 84-000225
 Ogata, H.
 84-000037
 84-000226
 Ogata, T.
 84-000194
 Ogura, M.
 84-000716
 Ohshima, T.
 84-000227
 Oikari, A.
 84-000111
 Ojima, Y.
 84-000319
 Okamoto, N.
 84-000568
 Olney, J. E.
 84-000525
 Omura, T.
 84-000208
 Onitake, K.
 84-000179
 Oonaka, S.
 84-000276
 Opdyke, D. F.
 84-000228
 Oshima, K.
 84-000257
 Overstreet, R. M.
 84-000558
 Ozretich, R. J.
 84-000669
 Packer, R.
 84-000229
 Padron, F. G.
 84-000361
 Page, J. W.
 84-000039
 Page, L. M.
 84-000530
 84-000531
 Pajak, P.
 84-000340
 Pal'mbakh, L. R.
 84-000123

AUTHOR INDEX

Pan, C. H.
 84-000023
 Panayotou, T.
 84-000687
 Pant, J. C.
 84-000670
 Paperna, I.
 84-000549
 84-000561
 Pappantoniou, A.
 84-000362
 Parker, N. C.
 84-000036
 Part, P.
 84-000110
 84-000660
 Partridge, B. L.
 84-000341
 Parwez, I.
 84-000152
 Pasanen, P.
 84-000668
 Pasmanik, M.
 84-000230
 Patzner, R. A.
 84-000197
 Paul, M. J.
 84-000231
 Pauley, G. B.
 84-000420
 Pavlov, D. S.
 84-000343
 Paxton, K. O.
 84-000757
 Pearce, J. B.
 84-000619
 Pearson, R. E.
 84-000693
 Pederson, R.
 84-000325
 Peer, M. M.
 84-000671
 Penaz, M.
 84-000361
 Pennec, J. P.
 84-000232
 Penrose, W. R.
 84-000683
 Perera, M. K.
 84-000136
 Perez, A.
 84-000767
 Perlman, P. W.
 84-000248
 Perrone, M., Jr.
 84-000419
 Pessoney, G. F.
 84-000026
 84-000613
 Peter, R. E.
 84-000023
 84-000130
 84-000171
 Peters, N.
 84-000582
 Petersen, C. W.
 84-000405
 Peterson, R. H.
 84-000620
 Peterson, R. M.
 84-000688
 Peterson, S.
 84-000621
 Petr, T.
 84-000761
 Petr, T. (ed.)
 84-000689
 Petrimoulx, H. J.
 84-000363
 Petrosky, C. E.
 84-000731
 Petty, J. D.
 84-000607
 Pflug, D. E.
 84-000420
 Philipp, D. P.
 84-000305
 Phillips, G. M.
 84-000709
 Phillips, J. D.
 84-000013
 Phipps, G. L.
 84-000682
 Picquelle, S. J.
 84-000385
 Pierson, J. M.
 84-000713
 Pike, A. W.
 84-000583
 Pinto, A.
 84-000233
 Piomelli, D.
 84-000233
 Piper, R. G.
 84-000254
 84-000466
 Pitcher, T. J.
 84-000453
 Pizza, J. C.
 84-000672
 Platts, W. S.
 84-000756
 Plisetskaya, E.
 84-000234
 84-000255
 Plotnikoff, M. D.
 84-000028
 Plumb, J. A.
 84-000545
 84-000662
 Plummer, K. M.
 84-000454
 Poddubnyy, A. G.
 84-000202
 Polanski, P. E.
 84-000395

- Polenyuk, V. V.
 84-000083
 Polyanskaya, I. B.
 84-000297
 Pope, J. G.
 84-000500
 Popper, A. N.
 84-000101
 Portelance, B.
 84-000496
 Portmann, J. E.
 84-000500
 Portus, M. I. G.
 84-000235
 Post, G.
 84-000562
 Potapova, T. V.
 84-000124
 Potter, I. C.
 84-000345
 Powers, D. A.
 84-000151
 84-000285
 84-000308
 84-000312
 Pratt, H. L., Jr.
 84-000471
 Present, T. M. C.
 84-000306
 Pribyl, S. P.
 84-000353
 Price, P. W.
 84-000543
 Primor, N.
 84-000236
 Prokes, M.
 84-000307
 84-000361
 Prosser, C. L.
 84-000193
 Prunet, P.
 84-000153
 Pugsley, R. W.
 84-000357
 Punhani, A. L.
 84-000380
 Purdy, E. J., Jr.
 84-000337
 Qasim, S. Z.
 84-000663
 Querat, B.
 84-000237
 Raab, R. L.
 84-000744
 Rab, P.
 84-000307
 Rach, J. J.
 84-000711
 Raisanen, G. A.
 84-000455
 Rajasilta, M.
 84-000456
 Raleigh, R. F.
 84-000364
 Ramakrishna, N.
 84-000285
 Randall, D. J.
 84-000068
 Randall, J. E.
 84-000532
 Randall, R. C.
 84-000669
 Rasch, E. M.
 84-000215
 84-000318
 Rauch, G.
 84-000457
 Redding, J. M.
 84-000238
 Reddy, Y. S.
 84-000633
 Redkozubov, Y. N.
 84-000472
 Reed, M.
 84-000741
 Reed, R. J.
 84-000777
 Reimchen, T. E.
 84-000097
 Reinitz, G.
 84-000038
 Rettig, R. B.
 84-000739
 Ribbink, A. J.
 84-000365
 Ribeyre, F.
 84-000636
 Rice, J. A.
 84-000473
 Richards, C. M.
 84-000584
 Richards, R. H.
 84-000131
 Richman, N. H.
 84-000098
 Richter, J.
 84-000239
 Rieber, R. W.
 84-000492
 Riggs, S. R.
 84-000762
 Ring, O.
 84-000660
 Rinne, J. N.
 84-000542
 Ritchie, T. C.
 84-000240
 Ritz, D. A.
 84-000450
 Roberson, K.
 84-000401
 Roberts, D. A.
 84-000454
 Roberts, D. D.
 84-000047
 Roberts, D. E., Jr.
 84-000241

AUTHOR INDEX

Roberts, M. S.
 84-000554
 Roberts, R. J.
 84-000199
 84-000673
 Roberts, T. R.
 84-000533
 Robertson, D. R.
 84-000352
 84-000406
 Robin, J.
 84-000567
 Robinson, M. G.
 84-000002
 Roch, M.
 84-000674
 84-000675
 Rodriguez, A.
 84-000386
 Rogalla, J. A.
 84-000597
 Rogers, L. J.
 84-000068
 Rogers, S. C.
 84-000242
 Rolfe, M. S.
 84-000540
 Rome, L. C.
 84-000206
 Ropson, I. J.
 84-000308
 84-000312
 Rosenblatt, R. H.
 84-000292
 Rosenlund, G.
 84-000205
 Ross, S. T.
 84-000504
 Rottmann, R. W.
 84-000022
 Rowland, S. J.
 84-000020
 84-000021
 Rowland, W. J.
 84-000099
 Rubcov, V.
 84-000066
 84-000067
 Ruby, S. M.
 84-000243
 84-000643
 Rudd, J. W. M.
 84-000622
 Ruiz Rios, L.
 84-000045
 Ruiz, L.
 84-000429
 Rumsey, G. L.
 84-000034
 84-000039
 Russell, D. J.
 84-000421
 Russell, F. E.
 84-000112
 Russell, L. R.
 84-000574
 Russo, J. L.
 84-000534
 Rutledge, L. J.
 84-000693
 Ryer, C. H.
 84-000458
 Saat, T. V.
 84-000244
 Saeed, D. W.
 84-000468
 Saeki, K.
 84-000612
 Safer, A. M. A.
 84-000100
 Safronov, S. N.
 84-000096
 Sagar, P. M.
 84-000459
 Saidel, W. M.
 84-000101
 Sakai, D. K.
 84-000245
 Salinas, I. M.
 84-000474
 Salwasser, H.
 84-000690
 Sandifer, P. A.
 84-000585
 Sandknop, E. M.
 84-000054
 84-000094
 Sangalang, G. B.
 84-000601
 Sangster, G. I.
 84-000724
 Sano, N.
 84-000387
 Sano, T.
 84-000568
 Santer, R. M.
 84-000057
 Sas, E.
 84-000246
 Satoh, S.
 84-000042
 Savage, A. G.
 84-000102
 Savitz, J.
 84-000342
 Saxena, O. P.
 84-000320
 Scanlan, J. W.
 84-000339
 Scarborough, D.
 84-000057
 Scheerer, P. D.
 84-000309
 Schindler, D. W.
 84-000616
 Schirmer, R. E.
 84-000649

AUTHOR INDEX

- Schmidt, J. T.
84-000247
- Schmidt, W.
84-000582
- Schneeberger, P. J.
84-000419
- Schnute, J.
84-000742
- Scholl, A.
84-000536
- Schreck, C. B.
84-000238
- Schreiber, W.
84-000623
- Schreibman, M. P.
84-000104
84-000157
84-000210
84-000248
- Schroeder, G. L.
84-000011
84-000249
- Schroeder, W. P.
84-000669
- Schullery, P.
84-000691
- Schultze, D. L.
84-000776
- Schutsky, R. M.
84-000337
- Schwartz, F. J.
84-000310
- Schwarz, F. J.
84-000280
- Scopettone, G. G.
84-000407
- Scott, A. P.
84-000250
- Scott, J. S.
84-000408
- Scott, K. R.
84-000048
- Scott, M. L.
84-000039
- Scott, P. W.
84-000586
- Seghers, B. H.
84-000326
84-000501
- Sehdev, R. S.
84-000546
- Sehgal, H. S.
84-000546
- Selmer-Olsen, A. R.
84-000593
- Serns, S. L.
84-000388
- Shabalin, V. N.
84-000783
- Shabana, M. B.
84-000654
84-000655
- Sharp, B. J.
84-000365
- Shaw, W. N.
84-000006
- Shea, T. B.
84-000564
- Shearer, K. D.
84-000043
- Sheridan, M. A.
84-000251
- Sheridan, P. F.
84-000493
- Sherwood, N. M.
84-000255
- Shimizu, S.
84-000725
- Shimowada, T.
84-000331
- Shireman, J. V.
84-000022
- Shires, S. W.
84-000676
- Shomura, R. S.
84-000699
- Shtaf, L. G.
84-000343
- Shulman, M. J.
84-000505
- Shuttleworth, T. J.
84-000252
- Shvetsov, F. G.
84-000460
- Siciliano, M. J.
84-000301
- Sidon, E. W.
84-000103
- Sidrevits, L. L.
84-000460
- Sihua, W.
84-000475
- Sil'yanova, Z. S.
84-000198
- Silver, C. A.
84-000337
- Silverman, R.
84-000104
- Simmons, M. A.
84-000615
- Simpson, T. H.
84-000423
- Sindermann, C. J.
84-000754
- Singh, N. K.
84-000749
- Singh, T.
84-000670
- Sismour, E. N.
84-000311
- Sissenwine, M. P.
84-000736
- Skaare, J. U.
84-000657
- Skalski, J. R.
84-000615
- Skinner, W. F.
84-000483

- Skorobogatov, M. A.
 84-000343
 Slaman, N. A.
 84-000114
 Slettengren, K.
 84-000207
 Slinger, S. J.
 84-000032
 84-000173
 84-000606
 Smart, A. M.
 84-000538
 Smatresk, N. J.
 84-000253
 Smeltzer, J. F.
 84-000029
 Smirnova, N. V.
 84-000175
 Smith, C. E.
 84-000254
 84-000466
 Smith, D. G.
 84-000329
 Smith, J. D.
 84-000587
 Smith, J. R.
 84-000669
 Smith, J. S.
 84-000396
 Smith, J. W.
 84-000588
 Smith, P. E.
 84-000489
 84-000502
 Smith, P. L.
 84-000273
 Smith, R. E., Jr.
 84-000300
 Smith, R. H.
 84-000700
 Smith, R. J. F.
 84-000427
 Smith, V. G. F.
 84-000494
 Smolowitz, R. J.
 84-000727
 Soderberg, R. W.
 84-000544
 Soin, S. G.
 84-000105
 Sokolowska, M.
 84-000023
 Solbe, J. F. De L. G.
 84-000680
 Somero, G. N.
 84-000292
 Sower, S. A.
 84-000255
 Spataru, P.
 84-000024
 Spieler, R. E.
 84-000036
 84-000222
 Squire, J. L., Jr.
 84-000389
 84-000422
 Srivastava, A. K.
 84-000677
 Stabler, F.
 84-000755
 Stablum, W.
 84-000128
 Stafford, E. A.
 84-000041
 Stanley, J. G.
 84-000701
 84-000702
 Staples, G.
 84-000325
 Starnes, L. B.
 84-000624
 Starodub, M. L.
 84-000460
 Stauffer, G. D.
 84-000356
 84-000743
 Stauffer, J. R., Jr.
 84-000300
 84-000487
 Stearns, S. C.
 84-000506
 84-000507
 Steele, C. W.
 84-000678
 Stehly, G. R.
 84-000653
 Stehr, C. M.
 84-000106
 Steinnes, D. N.
 84-000744
 Stelling, J. M.
 84-000312
 Stepanov, A. S.
 84-000139
 Stevens, D. E.
 84-000508
 Stevens, E. G.
 84-000054
 84-000094
 Stevens, G. T., Jr.
 84-000700
 Stevenson, F.
 84-000757
 Stewart, D. J.
 84-000480
 Stich, H. F.
 84-000582
 Stober, Q. J.
 84-000731
 Stratil, A.
 84-000313
 Strawn, K.
 84-000411
 Strelkov, L. A.
 84-000256
 84-000314

- Strickland, R. M.
84-000051
- Strydom, W.
84-000144
- Stuber, R. J.
84-000366
84-000367
- Subramanian, B. R.
84-000625
- Sugita, H.
84-000257
- Sullivan, C. V.
84-000258
- Sullivan, K. M.
84-000259
- Sumantadinata, K.
84-000315
- Sumida, B. Y.
84-000054
84-000094
- Sumpster, J. P.
84-000250
- Sundararaj, B. I.
84-000152
- Sundnes, G.
84-000302
- Surridge, J.
84-000128
- Sutterlin, A. M.
84-000008
- Suyama, M.
84-000165
- Svirskiy, A. M.
84-000202
- Swick, A. L.
84-000622
84-000627
- Swift, D. J.
84-000260
- Swift, M. C.
84-000679
- Swink, W. D.
84-000383
- Tachibana, M.
84-000261
- Tackett, D. L.
84-000025
- Tacon, A. G. J.
84-000040
84-000041
- Tai de Diaz, S.
84-000098
- Taivo, L.
84-000745
- Takahashi, H.
84-000063
84-000076
- Takeuchi, T.
84-000042
- Talhelm, D. R.
84-000706
- Tamura, M.
84-000257
- Tan, E. S. P.
84-000018
- Tanabe, S.
84-000625
- Taniguchi, M.
84-000555
- Taniguchi, N.
84-000315
- Tanino, Y.
84-000387
- Taniuchi, T.
84-000368
- Tariverdieva, T. G.
84-000728
- Tatsukawa, R.
84-000625
84-000629
- Taylor, G.
84-000548
- Taylor, M. H.
84-000180
- Taylor, W. W.
84-000692
- Terazaki, M.
84-000461
- Tett, P.
84-000673
- Thayer, G. W.
84-000764
- Thode, G.
84-000316
- Thomas, C. H.
84-000690
- Thomas, D. G.
84-000680
- Thomas, D. H.
84-000503
- Thomas, R. F.
84-000723
- Thomson, K. S.
84-000091
- Thorgaard, G. H.
84-000309
- Thorpe, J. E.
84-000199
- Thorson, L. C.
84-000784
- Thresher, R. E.
84-000409
- Thune, R. L.
84-000545
- Tjelmeland, S.
84-000373
- Toetz, D.
84-000416
- Tomasek, V.
84-000313
- Tone, F. C.
84-000649
- Toor, H. S.
84-000546
- Topping, G.
84-000626

Torres, P.
84-000589
Tortonese, E.
84-000495
Townsend, B. E.
84-000622
Tremaine, S. C.
84-000125
Tremblay, C.
84-000496
Trendall, J. T.
84-000410
Treshchev, A. I.
84-000728
Trexler, J. C.
84-000262
Trial, J. G.
84-000701
84-000702
Trinkaus, J. P.
84-000107
Tsai, C.
84-000681
Tsang, P. C.
84-000263
Turner, B. J.
84-000317
84-000318
84-000520
Turner, M.
84-000673
Turner, M. A.
84-000622
84-000627
Turner, R. J.
84-000641
Tyler, J. C.
84-000539
Tyler, R. W.
84-000731
Tytler, P.
84-000100
Tyus, H. M.
84-000782
U.S. Fish and Wildlife Service
84-000547
Ueda, H.
84-000279
Ueda, T.
84-000319
Unggui, A.
84-000476
Uthe, J. F.
84-000601
Uwa, H.
84-000320
Uziel, M. S.
84-000732
Valdes, R.
84-000767
Valenta, M.
84-000313
van Aller, R. T.
84-000026

...CONTINUED...
van Aller, R. T.
84-000613
Van As, J. G.
84-000561
Van Berge-Henegouwen, M.
84-000264
Van den Thillart, G.
84-000264
Van der Meij, J. C. A.
84-000274
Van Deventer, J. S.
84-000756
Van Dyke, J. M.
84-000001
Van Dyke, L.
84-000418
Van Hassel, J. H.
84-000617
Vandewalle, P.
84-000146
Vanegas, H.
84-000077
VanZandt, J.
84-000013
Vari, R. P.
84-000535
Varley, J. D.
84-000691
Varnavskaya, N. V.
84-000281
Vaughan, D. S.
84-000509
84-000611
84-000628
Vesely, K. R.
84-000562
Vestnes, G.
84-000780
Villaluz, A. C.
84-000476
Villwock, W.
84-000536
Voelker, J. L.
84-000010
Vojkovich, M.
84-000777
Von der Decken, A.
84-000205
Vooren, C. M.
84-000729
Voronina, A. S.
84-000176
Voytovich, N. V.
84-000108
Voytovich, V. V.
84-000108
Vrijenhoek, R. C.
84-000484
Vuorinen, I.
84-000456
Waas, B. P.
84-000411
Wada, M.
84-000553

- Wada, S.
 84-000227
 Waddell, I. F.
 84-000556
 Wade, C. S.
 84-000701
 84-000702
 Wahle, R. J.
 84-000265
 Wakabayashi, K.
 84-000166
 Wakeman, J. M.
 84-000266
 Walbridge, C. T.
 84-000682
 Walker, B. L.
 84-000173
 Walsh, P. J.
 84-000267
 Walton, C. J.
 84-000477
 Walton, D. G.
 84-000683
 Wandsvik, A.
 84-000437
 Waples, R. S.
 84-000321
 Warr, G. W.
 84-000268
 84-000269
 Watanabe, I.
 84-000629
 Watanabe, T.
 84-000042
 Waterman, S.
 84-000693
 Waters, T. F.
 84-000379
 Watkins, E. J.
 84-000026
 84-000613
 Weatherley, A. H.
 84-000242
 84-000270
 Weber, R. E.
 84-000271
 Webster, K. E.
 84-000597
 Wedemeyer, G. A.
 84-000272
 84-000407
 Weekes, P. J.
 84-000590
 Weeks, H. J.
 84-000412
 Weigmann, D. L.
 84-000031
 Weil, C.
 84-000008
 84-000023
 Weithman, A. S.
 84-000700
 Weitzman, S. H.
 84-000537
 Wekell, J. C.
 84-000043
 Wells, L.
 84-000349
 Welsh, M. J.
 84-000273
 Wendelaar Bonga, S. E.
 84-000274
 Werner, U.
 84-000369
 Weszely, R.
 84-000342
 Whaling, P. J.
 84-000592
 White, M. R.
 84-000703
 84-000704
 Whitear, M.
 84-000109
 Whitt, G. S.
 84-000305
 Whittier, J.
 84-000223
 Widlak, J. C.
 84-000370
 Wilcock, J. A.
 84-000390
 Wilkie, E. J.
 84-000551
 Williams, E. H., Jr.
 84-000569
 Williams, I. C.
 84-000559
 Williams, J. E.
 84-000371
 Williams, J. T.
 84-000525
 84-000538
 Wilson, R. R., Jr.
 84-000321
 Winch, J.
 84-000591
 Winfree, R. A.
 84-000044
 Winterbottom, R.
 84-000539
 Wippelhauser, G. S.
 84-000399
 Wirtz, P.
 84-000413
 Witzel, L. D.
 84-000414
 Wohlfarth, G. W.
 84-000024
 Wohlgemuth, E.
 84-000478
 Wohlschlag, D. E.
 84-000266
 Wolburg, H.
 84-000275
 Wolf, N. G.
 84-000462
 Wolniakowski, K. U.
 84-000595

AUTHOR INDEX

Wong, K.	Zaugg, W. S.
84-000145	84-000265
Woolcott, W. S.	Zeitler, M. H.
84-000065	84-000280
Wooley, C. M.	
84-000372	
Wooster, W. S.	
84-000510	
Worlund, D. D.	
84-000548	
Wourms, J. P.	
84-000155	
84-000239	
Wright, R. S.	
84-000185	
Yakovleva, E. P.	
84-000728	
Yamagata, Y.	
84-000276	
Yanling, L.	
84-000512	
Yasutake, W. T.	
84-000272	
Yeh, G. T.	
84-000737	
Yinrui, C.	
84-000497	
Yip, L. L.	
84-000277	
Yiyu, C.	
84-000497	
Yoshimizu, M.	
84-000553	
Yoshiyama, R. M.	
84-000509	
Yosida, T. H.	
84-000303	
84-000304	
Young, D. R.	
84-000602	
Young, G.	
84-000154	
84-000278	
84-000279	
Youngson, A. F.	
84-000423	
Youson, J. H.	
84-000103	
84-000200	
Yucheng, L.	
84-000294	
Yudanov, K. I.	
84-000783	
Yundt, S.	
84-000746	
Yung, K. H.	
84-000277	
Zahnnow, C.	
84-000396	
Zaiyun, L.	
84-000497	
Zama, K.	
84-000177	

GEOGRAPHICAL INDEX

Africa
 84-000761
 Africa: Jos Plateau
 84-000494
 Africa: Lake Malawi
 84-000365
 84-000448
 Alabama
 84-000569
 Alaska
 84-000541
 Alaska: Copper River
 84-000401
 Alaska: Kodiak Archipelago
 84-000499
 Alaska: Yukon River
 84-000390
 84-000735
 Antarctic
 84-000525
 Arctic
 84-000610
 Arizona
 84-000542
 Arkansas
 84-000346
 84-000704
 Arkansas: White River System
 84-000530
 Asia, Southeastern
 84-000533
 Atlantic Ocean, East Central
 84-000769
 Atlantic Ocean, North
 84-000049
 84-000345
 84-000350
 84-000373
 84-000374
 84-000375
 84-000443
 84-000516
 84-000527
 84-000619
 84-000772
 Atlantic Ocean, North: Scotian Shelf
 84-000408
 Australia
 84-000421
 84-000714
 Australia: Queensland
 84-000359
 Beaufort Sea
 84-000485
 Belize
 84-000513
 Bering Sea
 84-000510
 84-000570
 84-000698
 Bermuda
 84-000355
 Brazil
 84-000538

...CONTINUED...
 Brazil
 84-000571
 84-000572
 Burma
 84-000524
 California
 84-000094
 84-000344
 84-000356
 84-000385
 84-000389
 84-000393
 84-000454
 84-000489
 84-000502
 84-000503
 84-000709
 84-000766
 84-000768
 84-000774
 84-000775
 84-000776
 84-000777
 California: Los Angeles
 84-000602
 California: Mono Cty.: Lobdell Lake
 84-000492
 Canada: British Columbia
 84-000002
 Canada: Nova Scotia
 84-000408
 Canada: Ontario
 84-000326
 84-000414
 84-000501
 Canada: Ontario: English-Wabigoon River
 System
 84-000622
 84-000627
 Canada: Ontario: Lake Simcoe
 84-000357
 Canada: Quebec: St. Lawrence Estuary
 84-000496
 Caribbean Area
 84-000352
 84-000386
 84-000486
 Chile
 84-000589
 China
 84-000003
 84-000512
 China: Qinghai Prov.: Hurleg Lake
 84-000475
 China: Yunnan: Chenhai Lake
 84-000497
 Colorado
 84-000705
 Colorado: Arkansas River
 84-000491
 Colorado: Chatfield Reservoir
 84-000715
 Colorado: Dillon Reservoir
 84-000760

- Colorado: Trout Creek
 84-000596
 Columbia River
 84-000595
 Cuba
 84-000307
 84-000361
 Czechoslovakia: Bela River
 84-000441
 Czechoslovakia: Brno Reservoir
 84-000478
 Czechoslovakia: Musov Reservoir
 84-000469
 England
 84-000345
 Florida
 84-000001
 Florida: Apalachicola River
 84-000372
 Florida: Loee Key Natl. Mar. Sanctuary
 84-000710
 France
 84-000750
 Galapagos
 84-000413
 Great Lakes
 84-000395
 Gulf of Alaska
 84-000510
 Gulf of Mexico
 84-000708
 Hawaii
 84-000506
 Illinois: Williamson Cty.: Crab Orchard
 Lake
 84-000391
 India
 84-000394
 India: Ganges River
 84-000749
 Indian Ocean
 84-000406
 84-000523
 84-000532
 84-000689
 84-000765
 Japan
 84-000006
 Japan: Choshi
 84-000368
 Japan: Hokkaido
 84-000488
 Japan: Kojima Bay
 84-000577
 Japan: Otsuchi Bay
 84-000461
 Kansas
 84-000482
 84-000630
 84-000759
 Kansas: Neosho River
 84-000339
 Lake Erie
 84-000224
 Lake Erie: Long Point Bay
 84-000380
 Lake Huron
 84-000706
 Lake Michigan
 84-000349
 84-000419
 Lake Ontario
 84-000481
 84-000560
 84-000621
 Maine
 84-000412
 Malaysia: Paya Bungor
 84-000479
 Maryland: Youghiogheny River
 84-000487
 Mexico
 84-000513
 84-000528
 Mexico: Southern California
 84-000470
 Michigan
 84-000703
 Michigan: Alcona Cty.: Lake Huron
 84-000706
 Michigan: Poplar Creek
 84-000747
 84-000752
 Mississippi
 84-000504
 Mississippi: Tombigbee River
 84-000449
 Missouri: White River System
 84-000530
 Montana: Glacier Natl. Park
 84-000600
 Montana: Lolo Natl. For.
 84-000753
 Netherlands Antilles
 84-000329
 Nevada: Alvord Basin
 84-000371
 Nevada: Truckee River
 84-000407
 New Mexico
 84-000542
 New York
 84-000712
 New York: Calder Lake
 84-000354
 New York: Long Island Sound
 84-000763
 New Zealand
 84-000417
 84-000521
 84-000590
 84-000590
 84-000714
 New Zealand: Rakaia River
 84-000459
 Nigeria
 84-000360

GEOGRAPHICAL INDEX

...CONTINUED...

Nigeria
84-000770
North Carolina: Albemarle Sound
84-000762
North Carolina: Belews Lake
84-000576
North Dakota: Garrison Diversion Unit
84-000711
North Sea
84-000049
84-000500
Norway
84-000302
84-000373
84-000374
84-000375
84-000593
Ohio: Beaver Creek Reservoir
84-000757
Oklahoma
84-000482
84-000490
84-000704
Oklahoma: Lake Carl Blackwell
84-000416
Oklahoma: Lake Texoma
84-000608
Oregon
84-000418
Oregon: Alvord Basin
84-000371
Oregon: Blitzen River
84-000353
Pacific Ocean
84-000094
84-000306
84-000321
84-000344
84-000356
84-000358
84-000385
84-000389
84-000406
84-000422
84-000442
84-000454
84-000470
84-000485
84-000498
84-000503
84-000510
84-000511
84-000514
84-000521
84-000522
84-000523
84-000532
84-000689
84-000766
84-000768
84-000771
84-000774
84-000775

...CONTINUED...

Pacific Ocean
84-000776
84-000777
Pacific Ocean: California Current
84-000050
84-000489
84-000502
Pacific Ocean: Southern California Bight
84-000381
84-000393
Panama
84-000292
Pennsylvania: Monongahela River
84-000298
Pennsylvania: Monroe Cty.: Brodhead Creek
84-000483
Pennsylvania: Youghiogheny River
84-000487
Red Sea
84-000351
Rhode Island: Narragansett Bay
84-000763
Sargasso Sea
84-000399
Saudi Arabia
84-000495
Scotland
84-000423
South Africa
84-000012
South Carolina
84-000439
Sweden
84-000384
Tennessee: Morgan Cty.: Daddys Creek
84-000286
Texas
84-000015
84-000447
84-000704
84-000707
84-000708
Texas: Galveston Bay
84-000493
Texas: Lake Texoma
84-000608
Texas: Port Aransas
84-000631
Thailand
84-000524
United States
84-000006
United States, Southwestern
84-000484
USSR
84-000059
84-000295
Utah: Uinta Mountains
84-000751
Virginia
84-000340
84-000363
84-000614

GEOGRAPHICAL INDEX

Virginia: Claytor Lake
84-000438
Virginia: North Fork Holston River
84-000370
Washington
84-000667
Washington: Lake Sammamish
84-000420
Washington: Puget Sound
84-000051
West Virginia: Youghiogheny River
84-000487
Wisconsin
84-000597
84-000703
Wyoming
84-000748
84-000758
Wyoming: Yellowstone Natl. Park
84-000691
Zambia
84-000480
Zimbabwe
84-000694

SYSTEMATIC INDEX

- Abramis bjoerkna
 - Length-Weight Relationships
 - 84-000469
- Abramis brama
 - Reproduction
 - 84-000116
- Abudefduf concolor
 - Electrophoresis
 - 84-000292
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Abudefduf taurus
 - Electrophoresis
 - 84-000292
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Acanthemblemaria castroi
 - Spawning
 - 84-000413
- Acanthopagrus latus
 - Karyotypes
 - 84-000304
- Acanthopagrus schlegeli
 - Culture/Propagation
 - 84-000315
 - Genetics
 - 84-000315
 - Karyotypes
 - 84-000304
 - Variation Studies
 - 84-000315
- Acanthuridae
 - Foods/Feeding
 - 84-000444
 - Spawning
 - 84-000406
 - Trophic Relationships
 - 84-000444
- Acanthurus bahianus
 - Foods/Feeding
 - 84-000462
- Acanthurus guttatus
 - Trophic Relationships
 - 84-000432
- Acestrorhynchus grandoculis
 - New Species
 - 84-000526
- Acestrorhynchus isalineae
 - New Species
 - 84-000526
- Acestrorhynchus maculipinna
 - New Species
 - 84-000526
- Acipenser stellatus
 - Protein Synthesis
 - 84-000139
 - Reproductive System
 - 84-000139
- Acipenser gueldenstadti
 - Reproduction
 - 84-000141
- Acipenser nudiventris
 - Age/Growth
 - 84-000150
 - Karyotypes
 - 84-000282
 - Metabolic Rates
 - 84-000150
 - Temperature
 - 84-000150
- Acipenser stellatus
 - Reproduction
 - 84-000141
- Acipenseridae
 - Cloning
 - 84-000219
 - Reproductive System
 - 84-000219
- Ageneiosidae
 - Blood Chemistry
 - 84-000235
- Alburnus alburnus
 - Age/Growth
 - 84-000478
 - Length-Weight Relationships
 - 84-000478
 - Population Studies
 - 84-000478
- Alestopetersius interruptus
 - Meristic Studies
 - 84-000073
- Allodontichthys
 - Electrophoresis
 - 84-000520
 - Taxonomy
 - 84-000520
- Alopias vulpinus
 - Life History/General
 - 84-000344
- Alosa aestivalis
 - Fish Passage
 - 84-000730
 - Generators
 - 84-000730
- Alosa pseudoharengus
 - Age/Growth
 - 84-000477
 - Biomagnification
 - 84-000618
 - Dwarfism
 - 84-000477
 - Pentachlorophenol
 - 84-000618
- Alosa sapidissima
 - Abundance/Factors of
 - 84-000508
 - Enzymes
 - 84-000311
 - Fish Passage
 - 84-000730
 - Flow Regimes
 - 84-000508
 - Generators
 - 84-000730

...CONTINUED...

- Alosa sapidissima*
 - Malate Dehydrogenase
 - 84-000311
 - Variation Studies
 - 84-000311
- Ambloplites cavifrons*
 - Distribution/Geographical
 - 84-000363
 - Life History/General
 - 84-000363
- Ambloplites rupestris*
 - Foods/Feeding
 - 84-000428
 - Habitat Selection
 - 84-000340
 - Predator/Prey Relationships
 - 84-000428
- Amia calva*
 - Auditory Senses
 - 84-000090
- Amphiprion clarkii*
 - Commensalism
 - 84-000323
 - Habitat Selection
 - 84-000323
- Amphistichus argenteus*
 - Early Development
 - 84-000093
 - Skeletal System
 - 84-000093
- Anabas testudineus*
 - Insecticides
 - 84-000633
 - Lindane
 - 84-000633
- Anarhichas denticulatus*
 - Distribution/Vertical
 - 84-000350
 - Meristic Studies
 - 84-000350
- Anguilla anguilla*
 - Biochemical Composition
 - 84-000431
 - Blood Chemistry
 - 84-000237
 - Catecholamines
 - 84-000232
 - 84-000233
 - Endocrinology
 - 84-000142
 - Epieimeria anguillae*
 - 84-000559
 - Foods/Feeding
 - 84-000431
 - Parasites/Diseases
 - 84-000559
 - Protozoan Diseases
 - 84-000559
 - Reproduction
 - 84-000142
 - Steroids
 - 84-000142
 - 84-000237
- Anguilla australis*
 - Cardio-Vascular System
 - 84-000061
 - Gills
 - 84-000061
- Anguilla dieffenbachii*
 - Foods/Feeding
 - 84-000459
- Anguilla japonica*
 - Age/Growth
 - 84-000276
 - Oxygen
 - 84-000276
- Anguilla rostrata*
 - Bacterial Diseases
 - 84-000550
 - Metabolic Rates
 - 84-000267
 - Parasites/Diseases
 - 84-000550
 - Spawning
 - 84-000399
 - Temperature
 - 84-000267
 - Weather
 - 84-000399
- Anguilla vulgaris*
 - DDT
 - 84-000654
 - 84-000655
 - Endrin
 - 84-000654
 - 84-000655
 - Insecticides
 - 84-000654
 - 84-000655
 - Organochlorines
 - 84-000654
 - 84-000655
- Anoplopoma fimbria*
 - Life History/General
 - 84-000358
 - Maturation
 - 84-000358
 - Spawning
 - 84-000358
- Anostomidae*
 - Taxonomy
 - 84-000535
- Aphanius dispar*
 - Taxonomy
 - 84-000536
- Aphanius sirhani*
 - New Species
 - 84-000536
- Apteronotus albifrons*
 - Electrophysiology
 - 84-000246
- Archosargus probatocephalus*
 - Copper
 - 84-000678
 - Heavy Metals
 - 84-000678

SYSTEMATIC INDEX

Aristichthys nobilis
 Aeration
 84-000022
 Culture/Propagation
 84-000022
 84-000024
 Foods/Feeding
 84-000024
 Hybridization
 84-000284
 Polyculture
 84-000024
 Pond Culture
 84-000022
 84-000024
Arripis trutta
 Foods/Feeding
 84-000450
Atractoscion nobilis
 Distribution/Geographical
 84-000094
 Early Development
 84-000094
 Management/Research--Marine
 84-000777
Auchenipteridae
 Blood Chemistry
 84-000235
Bairdiella chrysura
 Foods/Feeding
 84-000439
 Movements
 84-000439
Barbus barbuis
 Electrophoresis
 84-000313
 Transferrins
 84-000313
Barbus meridionalis petenysi
 Electrophoresis
 84-000313
 Transferrins
 84-000313
Batrachoididae
 Foods/Feeding
 84-000352
 Spawning
 84-000352
Boleosoma phlox
 Taxonomy
 84-000531
Brachydanio rerio
 Gills
 84-000079
Brachymystax
 Meristic Studies
 84-000059
Brevoortia tyrannus
 Biomagnification
 84-000649
 Bromoform
 84-000649
 Chlorine
 84-000649

...CONTINUED...
Brevoortia tyrannus
 Power Plant Effluents
 84-000649
Callicthyidae
 Blood Chemistry
 84-000235
Callionymus beniteguri
 Karyotypes
 84-000303
 Sex Determination
 84-000303
Callionymus ornatipinnis
 Karyotypes
 84-000303
 Sex Determination
 84-000303
Carassius auratus
 Anoxia
 84-000217
 84-000264
 Blood Chemistry
 84-000222
 Cortisol
 84-000222
 Culture/Propagation
 84-000023
 DNA
 84-000221
 Early Development
 84-000095
 Electrophysiology
 84-000261
 Embryology
 84-000171
 Endocrinology
 84-000130
 84-000187
 Enzymes
 84-000208
 84-000230
 Foods/Feeding
 84-000453
 Goldfish Virus
 84-000564
 Gynogenesis
 84-000293
 Induced Maturation
 84-000023
 Learning
 84-000330
 Metabolic Rates
 84-000216
 Musculature
 84-000217
 Nervous System
 84-000095
 84-000214
 84-000275
 Parasites/Diseases
 84-000564
 84-000584
 Regeneration
 84-000247

SYSTEMATIC INDEX

...CONTINUED...

Carassius auratus
 Reproduction
 84-000130
 Serotonin
 84-000186
 Taxonomy
 84-000512
 Tumors
 84-000584
 Viral Diseases
 84-000564
 Vision
 84-000183
 84-000214
 84-000247
 84-000261
Carcharhinus velox
 Taxonomy
 84-000515
Catla catla
 Hernia
 84-000581
 Parasites/Diseases
 84-000581
Catostomus catostomus
 Flow Regimes
 84-000695
 Habitat Alterations
 84-000695
 Habitat Selection
 84-000695
Catostomus commersoni
 Caudal Neurosecretory System
 84-000145
Centrarchidae
 Parasites/Diseases
 84-000578
 Trematodes
 84-000578
 Uvulifer ambloplitis
 84-000578
Centropomis undecimalis
 Sex Reversal
 84-000241
Centropristis striatus
 Sex Reversal
 84-000241
Cephaloscyllium isabella
 Nervous System
 84-000074
 84-000092
Chaenogobius annularis
 Distribution/Geographical
 84-000488
Chanos chanos
 Age/Growth
 84-000476
 Culture/Propagation
 84-000017
 Fingerling Production
 84-000017
 Induced Maturation
 84-000017

...CONTINUED...

Chanos chanos
 Mortality Rates
 84-000476
 Temperature
 84-000476
Characidae
 Taxonomy
 84-000537
Chasmistes cujus
 Spawning
 84-000407
Chilara taylori
 Early Development
 84-000054
Chilodontidae
 Taxonomy
 84-000535
Chondrostoma polylepis
 Hybridization
 84-000288
Chriolepis
 Taxonomy
 84-000519
Cichlasoma citrinellum
 Aggressive Behavior
 84-000322
 84-000335
 Coloration
 84-000322
Cichlasoma meeki
 Spawning
 84-000402
 84-000403
Cichlasoma minckleyi
 Polymorphism
 84-000086
Cichlasoma nigrofasciatum
 Spawning
 84-000404
Cichlasoma sajica
 Life History/General
 84-000369
Cichlasoma tetracanthum
 Karyotypes
 84-000307
Cichlidae
 Chilodonella hexasticha
 84-000561
 Parasites/Diseases
 84-000561
 Protozoan Diseases
 84-000561
Citharichthys arctifrons
 Foods/Feeding
 84-000443
Clarias gariepinus
 Culture/Propagation
 84-000012
 Fertilization/Soil and Water
 84-000012
 Pond Culture
 84-000012
Clarias macrocephalus
 Culture/Propagation
 84-000018

SYSTEMATIC INDEX

...CONTINUED...

- Clarias macrocephalus
 - Induced Maturation
 - 84-000018
- Clupea harengus
 - Digestion Rates
 - 84-000147
 - Population Studies
 - 84-000375
- Colisa fasciatus
 - Heavy Metals
 - 84-000677
 - Manganese
 - 84-000677
- Colisa lalia
 - Sound Production
 - 84-000333
- Cololabis saira
 - Biomass
 - 84-000387
 - Population Studies
 - 84-000387
- Colossoma
 - Foods/Feeding
 - 84-000435
- Coregonidae
 - Electrophoresis
 - 84-000295
- Coregonus
 - Digestive System
 - 84-000089
 - Oil
 - 84-000610
- Coregonus autumnalis migratorius
 - Age/Growth
 - 84-000472
- Coregonus lavaretus pidschian
 - Morphology
 - 84-000108
- Coregonus peled
 - Embryology
 - 84-000176
 - RNA
 - 84-000176
- Coryphaenoides alateralis
 - Taxonomy
 - 84-000516
- Coryphaenoides armatus
 - Distribution/Geographical
 - 84-000321
 - Electrophoresis
 - 84-000321
 - Variation Studies
 - 84-000321
- Coryphaenoides theleostomus
 - Taxonomy
 - 84-000516
- Coryphaenoides yaquinae
 - Distribution/Geographical
 - 84-000321
 - Electrophoresis
 - 84-000321
 - Variation Studies
 - 84-000321
- Cottus bairdi
 - Habitat Selection
 - 84-000336
 - Sexual Dimorphism
 - 84-000325
 - Spawning
 - 84-000325
- Cottus girardi
 - Habitat Selection
 - 84-000336
- Craterocephalus marjoriae
 - Age/Growth
 - 84-000359
 - Spawning
 - 84-000359
- Craterocephalus stercusmuscarum
 - Age/Growth
 - 84-000359
 - Spawning
 - 84-000359
- Ctenopharyngodon idella
 - Aeration
 - 84-000022
 - Aquatic Plant Control
 - 84-000001
 - 84-000346
 - Culture/Propagation
 - 84-000022
 - 84-000024
 - Foods/Feeding
 - 84-000024
 - Hybridization
 - 84-000284
 - Life History/General
 - 84-000346
 - Polyculture
 - 84-000024
 - Pond Culture
 - 84-000022
 - 84-000024
 - Toxins
 - 84-000277
- Curimatidae -Taxonomy
 - 84-000535
- Cycleptus elongatus
 - Life History/General
 - 84-000339
- Cyclopterus lumpus
 - Distribution/Vertical
 - 84-000415
- Cymatogaster aggregata
 - Butylbenzyl Phthalate
 - 84-000669
 - Phthalate Acid Esters
 - 84-000669
- Cynoscion striatus
 - Fishing Gear
 - 84-000729
- Cyprinodon macularius
 - Variation Studies
 - 84-000317
- Cyprinodon pecosensis
 - Spawning
 - 84-000400

Cyprinus carpio
 Age/Growth
 84-000475
 Amino Acids
 84-000035
 84-000226
 Bacterial Diseases
 84-000546
 Biochemical Composition
 84-000280
 Complexing Agents
 84-000666
 Culture/Propagation
 84-000011
 84-000019
 84-000024
 84-000030
 84-000033
 84-000035
 84-000280
 Cypermethrin
 84-000676
 Digestive System/Bacterial Flora
 84-000033
 EDTA
 84-000666
 Eggs
 84-000067
 Excretory System
 84-000226
 Feeding Experiments
 84-000030
 84-000033
 84-000035
 84-000280
 Feeds
 84-000033
 Fertilization/Soil and Water
 84-000011
 Foods/Feeding
 84-000024
 Fungal Diseases
 84-000546
 Heavy Metals
 84-000641
 Hemorrhagic Septicemia
 84-000546
 Insecticides
 84-000676
 Learning
 84-000330
 Lernaea cyprinacea
 84-000586
 Lipid Metabolism
 84-000177
 Musculature
 84-000053
 84-000146
 84-000206
 Nickel
 84-000666
 NTA
 84-000666

...CONTINUED...
 Cyprinus carpio
 Parasites/Diseases
 84-000546
 84-000586
 Parasitic Copepods
 84-000586
 Pentachlorophenol
 84-000671
 Polyculture
 84-000019
 84-000024
 Pond Culture
 84-000011
 84-000024
 Reproduction
 84-000195
 Saprolegnia parasitica
 84-000546
 Specific Dynamic Action
 84-000158
 Temperature
 84-000030
 84-000206
 Zinc
 84-000641
 Dasyatis sabina
 Serotonin
 84-000240
 Dentex tumifrons
 Karyotypes
 84-000304
 Dicentrarchus labrax
 Abundance
 84-000345
 Age/Growth
 84-000345
 Atrispinum labracis
 84-000591
 Movements
 84-000345
 Parasites/Diseases
 84-000591
 Trematodes
 84-000591
 Doradidae
 Blood Chemistry
 84-000235
 Dorosoma cepedianum
 Distribution/Vertical
 84-000416
 Echiodon cryomargarites
 New Species
 84-000525
 Eigenmannia viriscens
 Electrophysiology
 84-000246
 Elasmobranchii
 Reproductive System
 84-000160
 Ellerkeldia
 Taxonomy
 84-000522
 Engraulis japonica
 Early Development
 84-000064

- Engraulis mordax
 - Biomass
 - 84-000743
 - Foods/Feeding
 - 84-000425
 - Population Studies
 - 84-000385
 - 84-000743
 - Production
 - 84-000381
 - Spawning
 - 84-000393
 - Vision
 - 84-000425
- Enneacanthus gloriosus
 - Hybridization
 - 84-000291
- Enneacanthus obesus
 - Hybridization
 - 84-000291
- Enneapterygius corallicola
 - Spawning
 - 84-000413
- Epinephelus cruentatus
 - Electrophoresis
 - 84-000292
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Epinephelus morio
 - Management/Research--Marine
 - 84-000767
 - Population Studies
 - 84-000767
- Epinephelus panamensis
 - Electrophoresis
 - 84-000292
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Eptatretus stouti
 - Embryology
 - 84-000071
 - Endocrinology
 - 84-000255
 - Hormones
 - 84-000255
 - Reproduction
 - 84-000255
- Erethistes maesotensis
 - New Species
 - 84-000524
- Esox lucius
 - Blood
 - 84-000102
 - Eggs
 - 84-000066
 - Heavy Metals
 - 84-000627
 - Mercury
 - 84-000627
- Etheostoma blennioides
 - Habitat Selection
 - 84-000326
- Etheostoma caeruleum
 - Habitat Selection
 - 84-000326
- Etheostoma cragini
 - Distribution/Geographical
 - 84-000491
- Etheostoma euzonum
 - Variation Studies
 - 84-000530
- Etheostoma flabellare
 - Habitat Selection
 - 84-000326
- Etheostoma nigrum
 - Habitat Selection
 - 84-000326
- Etheostoma rufileatum
 - Life History/General
 - 84-000370
- Etioplos suratensis
 - Digestion Rates
 - 84-000136
- Eviota albolineata
 - New Species
 - 84-000523
- Eviota cometa
 - New Species
 - 84-000523
- Eviota japonica
 - New Species
 - 84-000523
- Eviota latifasciata
 - New Species
 - 84-000523
- Eviota punctulata
 - New Species
 - 84-000523
- Eviota sigillata
 - New Species
 - 84-000523
- Eviota sparsa
 - New Species
 - 84-000523
- Evynnis japonica
 - Karyotypes
 - 84-000304
- Exocoetidae
 - Digestive System
 - 84-000082
- Exoglossum maxillingua
 - Life History/General
 - 84-000362
- Fugu rubripes
 - Heavy Metals
 - 84-000612
- Fundulus
 - Embryology
 - 84-000107
- Fundulus grandis
 - Eimeria funduli
 - 84-000558

SYSTEMATIC INDEX

...CONTINUED...

- Fundulus grandis
 - Lunar Influences
 - 84-000411
 - Parasites/Diseases
 - 84-000558
 - Protozoan Diseases
 - 84-000558
 - Reproductive System
 - 84-000072
 - Spawning
 - 84-000396
 - 84-000411
 - Temperature
 - 84-000396
- Fundulus heteroclitus
 - ATP
 - 84-000231
 - Blood Chemistry
 - 84-000203
 - Embryology
 - 84-000055
 - Endocrinology
 - 84-000153
 - Enzymes
 - 84-000151
 - 84-000231
 - Hormones
 - 84-000203
 - Hypoxia
 - 84-000203
 - Osmoregulation
 - 84-000180
 - 84-000231
 - Temperature
 - 84-000125
 - Variation Studies
 - 84-000285
 - 84-000308
 - 84-000312
- Gadus morhua
 - Biochemical Composition
 - 84-000169
 - Digestive System
 - 84-000170
 - Electrophoresis
 - 84-000302
 - Endocrinology
 - 84-000170
 - Maturation
 - 84-000169
 - Musculature
 - 84-000205
 - Polychlorinated Hydrocarbons
 - 84-000601
 - Population Genetics
 - 84-000302
 - Proteinase Inhibitors
 - 84-000167
 - Spawning
 - 84-000408
 - Starvation
 - 84-000205
- Galaxias brevipinnis
 - Foods/Feeding
 - 84-000459
- Galaxias paucispondylus
 - Foods/Feeding
 - 84-000459
- Gambusia affinis
 - Abundance/Factors of
 - 84-000506
 - 84-000507
 - Bothriocephalus acheilognathi
 - 84-000576
 - Cestodes
 - 84-000576
 - Fecundity
 - 84-000410
 - Genetics
 - 84-000507
 - Maturation
 - 84-000410
 - Parasites/Diseases
 - 84-000576
 - Phenols
 - 84-000632
 - Spawning
 - 84-000397
- Gasterosteus aculeatus
 - Cardio-Vascular System
 - 84-000057
 - Cestodes
 - 84-000575
 - Coloration
 - 84-000099
 - Parasites/Diseases
 - 84-000575
 - Predator/Prey Relationships
 - 84-000433
 - Schistocephalus solidus
 - 84-000575
 - Skeletal System
 - 84-000097
 - Spawning
 - 84-000412
 - Territorial Behavior
 - 84-000099
 - Variation Studies
 - 84-000097
- Gempylidae
 - Taxonomy
 - 84-000534
- Gila alvordensis
 - Life History/General
 - 84-000371
 - Status
 - 84-000371
- Gila boraxobius
 - Life History/General
 - 84-000371
 - Status
 - 84-000371
- Ginglymostoma cirratum
 - Enzymes
 - 84-000207
- Glyphidodontops biocellatus
 - Spawning
 - 84-000409

SYSTEMATIC INDEX

- Glyphidodontops cyaneus
 - Spawning
 - 84-000409
- Glyphidodontops rollandi
 - Spawning
 - 84-000409
- Glyptocephalus cynoglossus
 - Foods/Feeding
 - 84-000443
 - Spawning
 - 84-000408
- Gobiomorphus breviceps
 - Foods/Feeding
 - 84-000459
- Gobiomorphus cotidianus
 - Deretrema philippae
 - 84-000590
 - Parasites/Diseases
 - 84-000590
 - Trematodes
 - 84-000590
- Gobiomorphus hubbsi
 - Foods/Feeding
 - 84-000459
- Gobius bucchichi
 - Karyotypes
 - 84-000316
- Gobius cruentatus
 - Karyotypes
 - 84-000316
- Gosfordia truncata
 - Skeletal System
 - 84-000081
- Grammatorcynus bicarinatus
 - Taxonomy
 - 84-000514
- Grammatorcynus bilineatus
 - Taxonomy
 - 84-000514
- Gymnocephalus cernua
 - Electrophoresis
 - 84-000297
 - Variation Studies
 - 84-000297
- Haemulon aurolineatum
 - Life History/General
 - 84-000348
 - Management/Research--Marine
 - 84-000348
- Haemulon plumieri
 - Life History/General
 - 84-000348
 - Management/Research--Marine
 - 84-000348
- Halichoeres garnoti
 - Habitat Selection
 - 84-000329
- Helicolenus
 - Electrophoresis
 - 84-000299
 - Variation Studies
 - 84-000299
- Helicolenus fedorovi
 - Identification
 - 84-000511
- ...CONTINUED...
 - Helicolenus fedorovi
 - Morphology
 - 84-000511
 - Taxonomy
 - 84-000511
 - Helostoma temminckii
 - Auditory Senses
 - 84-000101
 - Hemipteronotus novacula
 - Habitat Selection
 - 84-000329
 - Hepsetus odoe
 - Life History/General
 - 84-000360
 - Herotilapia multispinosa
 - Spawning
 - 84-000398
 - Heterandria formosa
 - Embryology
 - 84-000155
 - Reproduction
 - 84-000155
 - Heteropneustes fossilis
 - Osmoregulation
 - 84-000152
 - Salinity
 - 84-000152
 - Hippoglossoides platessoides
 - Foods/Feeding
 - 84-000443
 - Spawning
 - 84-000408
 - Holocentrus ascensionis
 - Vision
 - 84-000077
 - Huso huso
 - Age/Growth
 - 84-000150
 - Metabolic Rates
 - 84-000150
 - Temperature
 - 84-000150
 - Hybopsis aestivalis tetranemus
 - Distribution/Geographical
 - 84-000491
 - Hybopsis monacha
 - Hybridization
 - 84-000286
 - Hypomesus transpacificus
 - Abundance/Factors of
 - 84-000508
 - Flow Regimes
 - 84-000508
 - Hypophthalmichthys molitrix
 - Bioenergetics
 - 84-000164
 - Culture/Propagation
 - 84-000011
 - 84-000024
 - Fertilization/Soil and Water
 - 84-000011
 - Food Conversion Efficiency
 - 84-000159

SYSTEMATIC INDEX

...CONTINUED...

Hypophthalmichthys molitrix

Foods/Feeding

84-000024

84-000164

Polyculture

84-000024

Pond Culture

84-000011

84-000024

Hypoblenius jenkinsi

Variation Studies

84-000306

Icelus

Distribution/Geographical

84-000529

Taxonomy

84-000529

Ictalurus melas

Habitat Selection

84-000366

Life History/General

84-000366

Ictalurus nebulosus

Endocrinology

84-000126

Hormones

84-000126

Ictalurus punctatus

Aeration

84-000026

Amino Acids

84-000226

Anesthetics

84-000662

Biomagnification

84-000614

Blood Chemistry

84-000036

Cage Culture

84-000016

Catfish Reovirus

84-000563

Chlorine

84-000637

Culture/Propagation

84-000006

84-000013

84-000016

84-000025

84-000026

84-000036

84-000044

84-000544

Diets

84-000044

Etomidate

84-000662

Excretory System

84-000226

Feeding Experiments

84-000036

84-000044

Feeds

84-000044

...CONTINUED...

Ictalurus punctatus

Heavy Metals

84-000614

Methemoglobinemia

84-000013

Nitrites

84-000013

Parasites/Diseases

84-000563

Pond Culture

84-000013

84-000025

84-000026

84-000544

Power Plant Effluents

84-000637

Sewage Effluents

84-000016

Stress

84-000662

Taste and Odor Problems

84-000613

Viral Diseases

84-000563

Water Quality

84-000025

Ictiobus cyprinellus

Spawning

84-000391

Ioa vigil

Taxonomy

84-000531

Istiophoridae

Body temperature

84-000120

Istiophorus platypterus

Heavy Metals

84-000592

Mercury

84-000592

Isurus oxyrinchus

Age/Growth

84-000471

Life History/General

84-000344

Jenynsia

Embryology

84-000239

Reproduction

84-000239

Katsuwonus pelamis

Population Studies

84-000386

Labeo rohita

Myxobolus

84-000557

Parasites/Diseases

84-000557

Potassium Permanganate

84-000646

Protozoan Diseases

84-000557

Salt

84-000646

SYSTEMATIC INDEX

- Labeotropheus
 - Life History/General
 - 84-000365
 - Taxonomy
 - 84-000365
 - Zoogeography
 - 84-000365
- Labio rohita
 - Bacterial Diseases
 - 84-000546
 - Fungal Diseases
 - 84-000546
 - Hemorrhagic Septicemia
 - 84-000546
 - Parasites/Diseases
 - 84-000546
 - Saprolegnia parasitica
 - 84-000546
- Lagodon rhomboides
 - Copper
 - 84-000678
 - Heavy Metals
 - 84-000678
- Lampetra fluviatilis
 - Endocrinology
 - 84-000117
- Lampetra lamotei
 - Endocrinology
 - 84-000140
- Lampetra planeri
 - Nervous System
 - 84-000109
 - Population Studies
 - 84-000384
- Lampetra reissneri
 - Coelomic Epithelium
 - 84-000063
- Lates calcarifer
 - Habitat Selection
 - 84-000421
- Leiognathidae
 - Bioluminescence
 - 84-000212
- Leiostomus xanthurus
 - Piscicides
 - 84-000651
 - Toxaphene
 - 84-000651
- Lempetra planeri
 - Age/Growth
 - 84-000384
- Lepidopsetta bilineata
 - Distribution/Geographical
 - 84-000096
 - Morphology
 - 84-000096
- Lepidopsetta mochigarei
 - Distribution/Geographical
 - 84-000096
 - Morphology
 - 84-000096
- Lepidosiren paradoxa
 - Foods/Feeding
 - 84-000426
- Lepisosteus osseus
 - Respiration
 - 84-000253
- Lepomis
 - Foods/Feeding
 - 84-000085
 - Mouth Parts
 - 84-000085
 - Trophic Relationships
 - 84-000085
- Lepomis cyanellus
 - Habitat Selection
 - 84-000367
 - Hybridization
 - 84-000289
 - Life History/General
 - 84-000367
 - Polyploidy
 - 84-000289
- Lepomis gibbosus
 - Foods/Feeding
 - 84-000428
 - Hybridization
 - 84-000289
 - Polyploidy
 - 84-000289
 - Predator/Prey Relationships
 - 84-000428
- Lepomis macrochirus
 - Aggressive Behavior
 - 84-000324
 - Bioenergetics
 - 84-000740
 - Biomagnification
 - 84-000614
 - Bluegill Virus
 - 84-000567
 - Copper
 - 84-000681
 - Digestive System
 - 84-000062
 - Foods/Feeding
 - 84-000428
 - Heavy Metals
 - 84-000614
 - Jet Fuel
 - 84-000681
 - Mobbing
 - 84-000324
 - Parasites/Diseases
 - 84-000567
 - Predator/Prey Relationships
 - 84-000428
 - Viral Diseases
 - 84-000567
 - Vision
 - 84-000331
- Leptocottus armatus
 - Predator/Prey Relationships
 - 84-000446

SYSTEMATIC INDEX

...CONTINUED...

Mallotus villosus
 Population Studies
 84-000373
 84-000374
 Spawning
 84-000373
 84-000374
Melanogrammus aeglefinus
 Electrophoresis
 84-000302
 Population Genetics
 84-000302
 Spawning
 84-000408
Menidia clarkhubbsi
 Evolution
 84-000518
Menidia menidia
 Schooling Behavior
 84-000332
Merluccius bilinearis
 Spawning
 84-000408
Merluccius gayi
 Foods/Feeding
 84-000442
 Trophic Relationships
 84-000442
Merluccius productus
 Population Studies
 84-000378
 Trophic Relationships
 84-000378
Microgadus tomcod
 Age/Growth
 84-000474
Micropogon undulatus
 Copper
 84-000678
 Heavy Metals
 84-000678
Micropterus dolomieu
 Age/Growth
 84-000467
 Culture/Propagation
 84-000015
 Flow Regimes
 84-000696
 Habitat Selection
 84-000696
 Life History/General
 84-000696
 Movements
 84-000420
 Orientation/Homing
 84-000420
Micropterus punctulatus
 Culture/Propagation
 84-000029
 Feeding Experiments
 84-000029
 Feeds
 84-000029

Leucopsarion petersi
 Pineal Body
 84-000076
Limanda ferruginea
 Foods/Feeding
 84-000443
 Spawning
 84-000408
Liopsetta putnami
 Oil
 84-000639
Liza abu
 pH
 84-000114
 Salinity
 84-000114
 Temperature
 84-000114
Liza ramada
 Sex Determination
 84-000060
Loricariidae
 Blood Chemistry
 84-000235
 Musculature
 84-000075
 Taxonomy
 84-000075
Lythrypnus nesiotes
 Habitat Selection
 84-000329
Maccullochella peeli
 Culture/Propagation
 84-000021
 Pond Culture
 84-000021
Macquaria ambigua
 Culture/Propagation
 84-000020
 Induced Maturation
 84-000020
Macrodon ancylodon
 Fishing Gear
 84-000729
Macropodus cupanus
 Foods/Feeding
 84-000436
 Salinity
 84-000436
 Temperature
 84-000436
Makaira indica
 Movements
 84-000422
Makaira nigricans
 Heavy Metals
 84-000592
 Mercury
 84-000592
Malacoptenus zonogaster
 Spawning
 84-000413
Mallotus villosus
 Movements
 84-000373

SYSTEMATIC INDEX

- Micropterus salmoides
 - Age/Growth
 - 84-000424
 - 84-000473
 - Bioenergetics
 - 84-000473
 - Electrophoresis
 - 84-000305
 - Foods/Feeding
 - 84-000342
 - 84-000424
 - 84-000428
 - Genetics
 - 84-000305
 - Home Range
 - 84-000342
 - Life History/General
 - 84-000354
 - 84-000361
 - Management/Research--Ponds
 - 84-000758
 - Management/Research--Reservoirs
 - 84-000715
 - Metabolic Rates
 - 84-000259
 - Population Studies
 - 84-000354
 - Predator/Prey Relationships
 - 84-000342
 - 84-000428
 - Production
 - 84-000354
 - Stocking/Introductions
 - 84-000715
 - Supplemental Stocking
 - 84-000715
 - Temperature
 - 84-000473
 - Thermal Pollution
 - 84-000473
 - Variation Studies
 - 84-000305
- Misgurnus
 - RNA
 - 84-000256
- Misgurnus fossilis
 - Embryology
 - 84-000123
 - 84-000190
 - 84-000191
 - 84-000192
 - 84-000196
 - 84-000256
 - Genetics
 - 84-000314
 - Lactate Dehydrogenase
 - 84-000190
 - 84-000191
 - Reproductive System
 - 84-000192
 - 84-000244
- Modicus
 - New Genus
 - 84-000521
- Modicus minimus
 - New Species
 - 84-000521
- Modicus tangaroa
 - New Species
 - 84-000521
- Morone saxatilis
 - Aroclor
 - 84-000672
 - Chlorine
 - 84-000604
 - Culture/Propagation
 - 84-000027
 - Fish Passage
 - 84-000730
 - Generators
 - 84-000730
 - Life History/General
 - 84-000372
 - Pollution Avoidance
 - 84-000604
 - Polychlorinated Biphenyls
 - 84-000672
 - Pond Culture
 - 84-000027
 - Population Studies
 - 84-000376
 - Power Plant Effluents
 - 84-000604
 - Pulp Mill Effluents
 - 84-000640
 - Thermal Pollution
 - 84-000604
- Moxostoma anisurum
 - Electrophoresis
 - 84-000300
- Moxostoma erythrurum
 - Electrophoresis
 - 84-000300
- Mugil cephalus
 - Blood Chemistry
 - 84-000223
 - DDT
 - 84-000654
 - 84-000655
 - Endrin
 - 84-000654
 - 84-000655
 - Insecticides
 - 84-000654
 - 84-000655
 - Length-Weight Relationships
 - 84-000429
 - Organochlorines
 - 84-000654
 - 84-000655
 - Salinity
 - 84-000223
- Mugil curema
 - Piscicides
 - 84-000651
 - Toxaphene
 - 84-000651

- Mustelus manazo
 - Life History/General
 - 84-000368
- Myctophidae
 - Distribution/ Vertical
 - 84-000355
 - Life History/General
 - 84-000355
- Myxine glutinosa
 - Reproduction
 - 84-000197
- Nasolamia
 - Taxonomy
 - 84-000515
- Nemachilus stoliczkai
 - Meristic Studies
 - 84-000052
- Neoceratodus forsteri
 - Blood Chemistry
 - 84-000178
 - Respiratory System
 - 84-000068
 - Skeletal System
 - 84-000081
- Neoceratodus gregoryi
 - Skeletal System
 - 84-000081
- Notothenia rossi marmorata
 - Reproduction
 - 84-000198
- Notropis atherinoides
 - Chlorine
 - 84-000637
 - Hybridization
 - 84-000298
 - Power Plant Effluents
 - 84-000637
- Notropis bairdi
 - Distribution/Factors of
 - 84-000482
- Notropis cornutus
 - Flow Regimes
 - 84-000701
 - Habitat Selection
 - 84-000701
 - Life History/General
 - 84-000701
- Notropis dorsalis
 - Distribution/Geographical
 - 84-000491
- Notropis galacturus
 - Hybridization
 - 84-000286
- Notropis giardi
 - Abundance/Factors of
 - 84-000482
 - Distribution/Factors of
 - 84-000482
 - Flow Regimes
 - 84-000482
- Notropis volucellus
 - Hybridization
 - 84-000298
- Oligolepis acutipennis
 - Maturation
 - 84-000394
 - Reproductive System
 - 84-000069
 - Spawning
 - 84-000394
- Oligosarcus longirostris
 - New Species
 - 84-000526
- Oligosarcus paranensis
 - New Species
 - 84-000526
- Oligosarcus planaltinae
 - New Species
 - 84-000526
- Oligosarcus schindleri
 - New Species
 - 84-000526
- Oncorhynchus
 - Abundance/Factors of
 - 84-000667
 - Culture/Propagation
 - 84-000006
 - Diets
 - 84-000006
 - Feeding Experiments
 - 84-000006
 - Fins
 - 84-000056
 - Fry Traps
 - 84-000718
 - Population Studies
 - 84-000739
 - Sexual Dimorphism
 - 84-000056
 - Stocking/Introductions
 - 84-000739
 - Volcanos
 - 84-000667
- Oncorhynchus gorbuscha
 - Abundance/Factors of
 - 84-000499
 - ATP
 - 84-000258
 - Hormones
 - 84-000258
- Oncorhynchus keta
 - Culture/Propagation
 - 84-000007
 - Fish Hatchery Effluents
 - 84-000007
 - Foods/Feeding
 - 84-000461
 - Predator/Prey Relationships
 - 84-000446
- Oncorhynchus kisutch
 - ATP
 - 84-000265
 - Blood Chemistry
 - 84-000161
 - Copper
 - 84-000638

SYSTEMATIC INDEX

...CONTINUED...

Oncorhynchus kisutch
 Dredging
 84-000659
 Endocrinology
 84-000234
 Flow Regimes
 84-000697
 Gills
 84-000098
 Habitat Alterations
 84-000697
 Habitat Selection
 84-000697
 Heavy Metals
 84-000638
 Lipid Metabolism
 84-000251
 Movements
 84-000418
 Orientation/Homing
 84-000418
 Osmoregulation
 84-000238
 Parr-Smolt Transformation
 84-000098
 Salinity
 84-000238
 Sediment Bioassays
 84-000659
 Spawning Migration
 84-000418
 Stress
 84-000238
 84-000272
 Oncorhynchus masou
 Amino Acids
 84-000037
 Culture/Propagation
 84-000037
 Diets
 84-000037
 Feeding Experiments
 84-000037
 Parasites/Diseases
 84-000568
 Tumors
 84-000568
 Viral Diseases
 84-000568
 Oncorhynchus nerka
 Biochemical Composition
 84-000148
 Biodegradation
 84-000600
 Blood Chemistry
 84-000161
 Excretory System
 84-000148
 Hormones
 84-000119
 Parasites/Diseases
 84-000580
 Reproduction
 84-000119

...CONTINUED...

Oncorhynchus nerka
 Sewage Effluents
 84-000600
 Spawning Migration
 84-000401
 Stress
 84-000148
 Tumors
 84-000580
 Variation Studies
 84-000281
 Oncorhynchus rhodurus
 Amino Acids
 84-000037
 Culture/Propagation
 84-000037
 Diets
 84-000037
 Endocrinology
 84-000279
 Feeding Experiments
 84-000037
 Reproduction
 84-000279
 Oncorhynchus tshawytscha
 Abundance/Factors of
 84-000508
 Ammonia
 84-000650
 Dewatering
 84-000118
 Fish Stocks
 84-000390
 Flow Regimes
 84-000508
 Parasites/Diseases
 84-000580
 Tumors
 84-000580
 Ophidion scrippsae
 Early Development
 84-000054
 Ophioblennius atlanticus
 Electrophoresis
 84-000292
 Lactate Dehydrogenase
 84-000292
 Variation Studies
 84-000292
 Opsanus tau
 Enzymes
 84-000230
 Sound Production
 84-000327
 84-000338
 Swimbladder
 84-000338
 Toxins
 84-000218
 Oreochromis
 Culture/Propagation
 84-000011
 Pond Culture
 84-000011

SYSTEMATIC INDEX

- Oreochromis
 - Fertilization/Soil and Water
 - 84-000011
- Oreochromis alcalicus grahami
 - Temperature
 - 84-000184
- Oreochromis mossambicus
 - Bacterial Diseases
 - 84-000549
 - Hormones
 - 84-000185
 - Nitrofurazone
 - 84-000549
 - Parasites/Diseases
 - 84-000549
 - Sex Reversal
 - 84-000185
- Orthopristis chrysoptera
 - Life History/General
 - 84-000347
 - Management/Research--Marine
 - 84-000347
- Oryzias latipes
 - Embryology
 - 84-000078
 - Induced Maturation
 - 84-000179
 - Reproduction
 - 84-000179
 - Sodium Arsenite
 - 84-000634
- Oryzias melastigma
 - DNA
 - 84-000320
 - Karyotypes
 - 84-000320
- Osmerus mordax
 - Biomagnification
 - 84-000618
 - Distribution/Geographical
 - 84-000357
 - Life History/General
 - 84-000357
 - Pentachlorophenol
 - 84-000618
 - Zoogeography
 - 84-000481
- Ostraciidae
 - Taxonomy
 - 84-000539
- Pagrus auriga
 - Hermaphroditism
 - 84-000115
- Pagrus ehrenbergi
 - Hermaphroditism
 - 84-000115
- Pagrus major
 - Karyotypes
 - 84-000304
- Pagrus orphus
 - Hermaphroditism
 - 84-000115
- Pagrus pagrus
 - Hermaphroditism
 - 84-000115
- Paracheirodon
 - Taxonomy
 - 84-000537
- Paralichthys californicus
 - Foods/Feeding
 - 84-000454
- Paralichthys dentatus
 - Foods/Feeding
 - 84-000443
- Paralichthys oblongus
 - Foods/Feeding
 - 84-000443
- Paraliparis hystrix
 - New Species
 - 84-000527
- Parapercis colias
 - Movements
 - 84-000417
- Pardachirus marmoratus
 - Toxins
 - 84-000236
- Parophrys vetulus
 - Epidermal Papillomas
 - 84-000582
 - Parasites/Diseases
 - 84-000582
- Perca flavescens
 - Age/Growth
 - 84-000464
 - Distribution/Seasonal
 - 84-000419
 - Distribution/Vertical
 - 84-000419
 - Foods/Feeding/Selectivity
 - 84-000455
 - Maturation
 - 84-000137
 - Metabolic Rates
 - 84-000259
 - Steroids
 - 84-000137
- Perca fluviatilis
 - Copper
 - 84-000642
 - Heavy Metals
 - 84-000642
- Percidae
 - Bird Predation
 - 84-000501
- Percina
 - Skeletal System
 - 84-000065
 - Taxonomy
 - 84-000065
- Percina maculata
 - Habitat Selection
 - 84-000326
- Percina ouachitae
 - Foods/Feeding/Selectivity
 - 84-000449
 - Trophic Relationships
 - 84-000449
- Percina sciera
 - Foods/Feeding/Selectivity
 - 84-000449

SYSTEMATIC INDEX

...CONTINUED...

- Percina sciera
 - Trophic Relationships
 - 84-000449
- Periophthalmus koelreuteri
 - Excretory System
 - 84-000100
 - Head Kidney
 - 84-000100
- Petromyzon marinus
 - Digestive System
 - 84-000200
 - Endocrinology
 - 84-000255
 - Excretory System
 - 84-000103
 - Hormones
 - 84-000255
 - Lamprey Control
 - 84-000712
 - Life History/General
 - 84-000712
 - Lipid Metabolism
 - 84-000200
 - Matamorphosis
 - 84-000103
 - Reproduction
 - 84-000255
- Petrotilapia tridentiger
 - Foods/Feeding
 - 84-000448
- Phoxinus erythrogaster
 - Distribution/Geographical
 - 84-000491
- Phoxinus phoxinus
 - Flow Regimes
 - 84-000343
- Phrynorhombus regius
 - Foods/Feeding
 - 84-000434
- Pimelodidae
 - Blood Chemistry
 - 84-000235
- Pimephales promelas
 - Alarm Substances
 - 84-000427
 - Aliphatic Hydrocarbons
 - 84-000682
 - Cadmium
 - 84-000635
 - Flyash
 - 84-000635
 - Heavy Metals
 - 84-000635
 - Pentachlorophenol
 - 84-000607
 - Predator/Prey Relationships
 - 84-000427
- Platichthys flesus
 - Biochemical Composition
 - 84-000113
 - Musculature
 - 84-000113
 - Stress
 - 84-000113
- Platichthys stellatus
 - Epidermal Pappilomas
 - 84-000582
 - Parasites/Diseases
 - 84-000582
- Platycephalus laevis
 - Foods/Feeding
 - 84-000440
- Plecoglossus altivelis
 - Bacterial Diseases
 - 84-000555
 - Endocrinology
 - 84-000166
 - Lipid Composition
 - 84-000165
 - Parasites/Diseases
 - 84-000555
 - Reproduction
 - 84-000166
 - Streptococcus
 - 84-000555
- Plectranthias exsul
 - New Species
 - 84-000522
- Pleuronectes platessa
 - Biochemical Composition
 - 84-000113
 - Foods/Feeding
 - 84-000434
 - Musculature
 - 84-000113
 - Stress
 - 84-000113
- Pleuronichthys coenosus
 - Eggs
 - 84-000106
- Poecilia
 - Triploid Fish
 - 84-000318
 - Unisex Populations
 - 84-000318
 - Variation Studies
 - 84-000318
- Poecilia formosa
 - Reproduction
 - 84-000215
- Poecilia latipinna
 - Endocrinology
 - 84-000278
 - Reproduction
 - 84-000278
 - Salinity
 - 84-000262
 - Spawning
 - 84-000396
 - Temperature
 - 84-000262
 - 84-000396
- Poeciliopsis
 - Habitat Selection
 - 84-000334
 - Reproduction
 - 84-000189

...CONTINUED...

- Poeciliopsis
 - Unisex Populations
 - 84-000189
 - 84-000334
- Poeciliopsis monacha-latidens
 - Unisex Populations
 - 84-000201
- Poeciliopsis occidentalis
 - Status
 - 84-000484
- Prionace glauca
 - Life History/General
 - 84-000344
- Prochilodontidae
 - Taxonomy
 - 84-000535
- Protopterus aethiopicus
 - Hypoxia
 - 84-000143
- Pseudopleuronectes americanus
 - Antifreeze Production
 - 84-000122
 - Blood Chemistry
 - 84-000122
 - Foods/Feeding
 - 84-000443
 - Spawning
 - 84-000408
- Pseudopleuronectes americanus
 - Antifreeze Production
 - 84-000225
- Pseudotropheus zebra
 - Foods/Feeding
 - 84-000448
- Pungitius pungitius
 - Cardio-Vascular System
 - 84-000057
 - Predator/Prey Relationships
 - 84-000433
- Puntius conchoniis
 - Carbaryl
 - 84-000670
 - Dimethoate
 - 84-000670
 - Insecticides
 - 84-000670
 - Organophosphates
 - 84-000670
- Quisquilius hipoliti
 - Habitat Selection
 - 84-000329
- Raja eglanteria
 - Nervous System
 - 84-000084
 - 84-000121
- Raja erinacea
 - Osmoregulation
 - 84-000134
- Rastrinus
 - Distribution/Geographical
 - 84-000529
 - Taxonomy
 - 84-000529
- Rhamdia reddelli
 - New Species
 - 84-000528
- Rhinichthys atratulus
 - Light
 - 84-000430
 - Predator/Prey Relationships
 - 84-000430
- Rhinomugil corsula
 - Pentachlorophenol
 - 84-000671
- Rutilus arcasi
 - Hybridization
 - 84-000288
- Rutilus rutilus
 - Age/Growth
 - 84-000468
 - Flow Regimes
 - 84-000343
 - Impoundment
 - 84-000468
 - Length-Weight Relationships
 - 84-000469
- Salmo clarki
 - Life History/General
 - 84-000371
 - Status
 - 84-000371
- Salmo clarki lewisi
 - Culture/Propagation
 - 84-000254
 - Egg Production
 - 84-000254
 - Reproduction
 - 84-000254
 - Temperature
 - 84-000254
- Salmo gairdneri
 - Alarm Substances
 - 84-000427
 - Amino Acids
 - 84-000039
 - 84-000149
 - Bacterial Diseases
 - 84-000554
 - Biochemical Composition
 - 84-000270
 - Blood Chemistry
 - 84-000229
 - 84-000269
 - 84-000668
 - Cadmium
 - 84-000110
 - 84-000674
 - 84-000675
 - 84-000680
 - Calcium
 - 84-000110
 - Carcass Traits
 - 84-000290
 - Cestodes
 - 84-000589
 - Chlorine
 - 84-000637

SYSTEMATIC INDEX

...CONTINUED...

Salmo gairdneri

Competition

84-000452

Copper

84-000674

84-000675

Culture/Propagation

84-000008

84-000009

84-000028

84-000031

84-000032

84-000038

84-000039

84-000040

84-000041

84-000043

84-000544

Cyanide

84-000643

Cypermethrin

84-000676

Diets

84-000038

84-000040

Digestive System

84-000156

Dinoflagellates

84-000673

Diphyllobothrium

84-000589

Embryology

84-000088

Endocrinology

84-000188

Enteric Redmouth Disease

84-000554

Enzymes

84-000111

84-000138

84-000149

Excretory System

84-000131

84-000135

Feeding Experiments

84-000028

84-000031

84-000032

84-000038

84-000039

84-000040

84-000041

84-000043

Feeds

84-000031

84-000032

84-000041

Fish Grading

84-000009

Fish Passage

84-000730

Foods/Feeding/Selectivity

84-000452

...CONTINUED...

Salmo gairdneri

Formalin

84-000668

Generators

84-000730

Growth Stimulants

84-000028

Gyrodinium aureolum

84-000673

Heavy Metals

84-000110

84-000636

84-000674

84-000675

84-000680

Hexachlorobenzene

84-000657

Hormones

84-000185

Hybridization

84-000309

Induced Maturation

84-000008

Insecticides

84-000606

84-000661

84-000676

Karyotypes

84-000319

Learning

84-000330

Life History/General

84-000353

Lipid Composition

84-000270

Malachite Green

84-000664

Mercury

84-000110

84-000636

Metabolic Rates

84-000242

Nematodes

84-000574

Nitric Acid

84-000679

Nutrition

84-000039

84-000043

84-000173

Organochlorines

84-000606

Osmoregulation

84-000131

84-000149

84-000188

Parasites/Diseases

84-000554

84-000574

84-000580

84-000589

84-000673

Permethrin

84-000661

SYSTEMATIC INDEX

...CONTINUED...

Salmo gairdneri

Polychlorinated Biphenyls

84-000606

84-000660

Polymorphism

84-000319

Polyploidy

84-000287

Pond Culture

84-000544

Power Plant Effluents

84-000637

Predator/Prey Relationships

84-000427

Reproduction

84-000250

Sex Reversal

84-000185

Sperm

84-000133

Steroids

84-000156

Stress

84-000272

Temperature

84-000135

Toxic Algae

84-000673

Triploid Fish

84-000309

Truttaedacnitis truttae

84-000574

Tumors

84-000580

Yersinia ruckeri

84-000554

Zinc

84-000043

84-000674

84-000675

Salmo salar

Acid Precipitation

84-000620

Blood Chemistry

84-000668

Carcass Traits

84-000290

Chloride Cells

84-000199

Condition Factors

84-000463

Corticosteroids

84-000199

Fish Passage

84-000730

Formalin

84-000668

Fungal Diseases

84-000556

Generators

84-000730

Length-Weight Relationships

84-000463

...CONTINUED...

Salmo salar

Movements

84-000423

Otoliths

84-000070

Parasites/Diseases

84-000556

Phialophora

84-000556

Salmo trutta

Culture/Propagation

84-000009

84-000010

Fish Grading

84-000009

Foods/Feeding

84-000441

84-000459

Foods/Feeding/Selectivity

84-000457

Hybridization

84-000309

Hypoxia

84-000645

Incubation

84-000010

Insecticides

84-000645

Lindane

84-000645

Management/Research--Reservoirs

84-000760

Spawning

84-000414

84-000760

Triploid Fish

84-000309

Salmonidae

Biomagnification

84-000618

Blood Chemistry

84-000245

Hematozoa

84-000560

Management/Research--Rivers and

Streams

84-000748

Mine Effluents

84-000596

Parasites/Diseases

84-000560

Pentachlorophenol

84-000618

Protozoan Diseases

84-000560

Riparian Habitat

84-000748

Sedimentation

84-000747

84-000752

Stream Improvement/General

84-000748

Trypanoplasma salmositica

84-000560

SYSTEMATIC INDEX

- Salvelinus
 - Biological Indicators
 - 84-000605
- Salvelinus alpinus
 - Digestion Rates
 - 84-000437
 - Foods/Feeding
 - 84-000437
 - Nutrition
 - 84-000437
 - Oil
 - 84-000610
- Salvelinus confluentus
 - Hybridization
 - 84-000296
 - Meristic Studies
 - 84-000296
- Salvelinus fontinalis
 - Age/Growth
 - 84-000466
 - Competition
 - 84-000452
 - Foods/Feeding/Selectivity
 - 84-000452
 - Habitat Selection
 - 84-000364
 - Hybridization
 - 84-000296
 - 84-000309
 - Life History/General
 - 84-000364
 - Maturation
 - 84-000137
 - Meristic Studies
 - 84-000296
 - Osmoregulation
 - 84-000211
 - Salinity
 - 84-000211
 - Spawning
 - 84-000414
 - Steroids
 - 84-000137
 - Temperature
 - 84-000466
 - Triploid Fish
 - 84-000309
- Salvelinus namaycush
 - Amino Acids
 - 84-000034
 - Culture/Propagation
 - 84-000034
 - Cystidicola farionis
 - 84-000570
 - Life History/General
 - 84-000349
 - Nematodes
 - 84-000570
 - Nutrition
 - 84-000034
 - Parasites/Diseases
 - 84-000570
 - Population Studies
 - 84-000349
- ...CONTINUED...
 - Salvelinus namaycush
 - Reproduction
 - 84-000243
 - Sanopus greenfieldorum
 - New Species
 - 84-000513
 - Sanopus reticulatus
 - New Species
 - 84-000513
 - Sarotherodon niloticus
 - Culture/Propagation
 - 84-000024
 - Foods/Feeding
 - 84-000024
 - Polyculture
 - 84-000024
 - Pond Culture
 - 84-000024
 - Scardinius erythrophthalmus
 - Length-Weight Relationships
 - 84-000469
 - Scaridae
 - Foods/Feeding
 - 84-000444
 - Habitat Selection
 - 84-000329
 - Trophic Relationships
 - 84-000444
 - Scarus iserti
 - Foods/Feeding
 - 84-000462
 - Sciaenops ocellatus
 - Blood Chemistry
 - 84-000266
 - Osmoregulation
 - 84-000266
 - Sex Reversal
 - 84-000241
 - Scleropages schneichardti
 - Blood Chemistry
 - 84-000178
 - Scomber japonicus
 - Auditory Senses
 - 84-000083
 - Management/Research--Marine
 - 84-000774
 - Scomber scombrus
 - Blood Chemistry
 - 84-000260
 - Stress
 - 84-000260
 - Scomberomorus commersoni
 - Toxins
 - 84-000204
 - Scophthalmus aquosus
 - Foods/Feeding
 - 84-000443
 - Scophthalmus maximus
 - Foods/Feeding
 - 84-000434
 - Scophthalmus rhombus
 - Foods/Feeding
 - 84-000434

SYSTEMATIC INDEX

Scorpaena guttata
 Toxins
 84-000112
Scyliorhinus canicula
 Foods/Feeding
 84-000445
Scyliorhinus torazame
 Lipid Composition
 84-000163
Sebastes
 Electrophoresis
 84-000299
 Variation Studies
 84-000299
Sebastes mystinus
 Age/Growth
 84-000470
Sebastes taczanowskii
 Auditory Senses
 84-000083
Semotilus atromaculatus
 Distribution/Geographical
 84-000491
 Light
 84-000430
 Predator/Prey Relationships
 84-000430
Semotilus corporalis
 Flow Regimes
 84-000702
 Habitat Alterations
 84-000702
 Habitat Selection
 84-000702
Seriola lalandei
 Management/Research--Marine
 84-000768
Serranus fasciatus
 Hermaphroditism
 84-000405
 Spawning
 84-000405
Serranus subligarius
 Coloration
 84-000392
 Hermaphroditism
 84-000392
 Spawning
 84-000392
Siganus
 Oil Dispersants
 84-000647
Siganus rivulatus
 Life History/General
 84-000351
Solea solea
 Epidermal Lesions
 84-000540
 Fin Rot
 84-000540
 Foods/Feeding
 84-000434
 Lymphocystis
 84-000540

...CONTINUED...

Solea solea
 Parasites/Diseases
 84-000540
 Tumors
 84-000540
Sparisoma
 Foods/Feeding
 84-000462
Sparus aurata
 Bacterial Diseases
 84-000549
 Lipid Composition
 84-000227
 Nitrofurazone
 84-000549
 Parasites/Diseases
 84-000549
Sparus sarba
 Karyotypes
 84-000304
Spheroides glaber
 Immunoglobulins
 84-000268
Sphyræna argentea
 Management/Research--Marine
 84-000776
Spirinchus thaleichthys
 Abundance/Factors of
 84-000508
 Flow Regimes
 84-000508
Sprattus sprattus balticus
 Foods/Feeding
 84-000460
Squalus acanthias
 Blood Chemistry
 84-000271
 Catecholamines
 84-000228
 Digestive System
 84-000220
 Enzymes
 84-000209
 Lipid Composition
 84-000163
 Nervous System
 84-000220
 Rectal Gland
 84-000273
 Reproduction
 84-000209
 Steroids
 84-000263
Starksia brasiliensis
 Morphology
 84-000538
 Taxonomy
 84-000538
Starksia hassi
 Habitat Selection
 84-000329
Sternopygus dariensis
 Electrophysiology
 84-000213

...CONTINUED...

- Sternopygus dariensis
 - Steroids
 - 84-000213
- Stizostedion vitreum vitreum
 - Digestion Rates
 - 84-000132
 - Electrofishing
 - 84-000388
 - Population Studies
 - 84-000388
- Synanceia trachynis
 - Toxins
 - 84-000127
 - 84-000128
- Syngnathus fuscus
 - Digestion Rates
 - 84-000458
 - Foods/Feeding
 - 84-000458
 - Temperature
 - 84-000458
- Takifugu pardalis
 - Toxins
 - 84-000194
- Tautoglabrus adspersus
 - Oil
 - 84-000683
- Tetrapturus albidus
 - Heavy Metals
 - 84-000592
 - Mercury
 - 84-000592
- Tetrapturus audax
 - Management/Research--Marine
 - 84-000766
- Thalassoma bifasciatum
 - Electrophoresis
 - 84-000292
 - Habitat Selection
 - 84-000329
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Thalassoma lucasanum
 - Electrophoresis
 - 84-000292
 - Lactate Dehydrogenase
 - 84-000292
 - Variation Studies
 - 84-000292
- Thyrsoocypris
 - New Genus
 - 84-000533
- Thunnus alalunga
 - Management/Research--Marine
 - 84-000775
- Thunnus thynnus
 - Management/Research--Marine
 - 84-000771
 - Schooling Behavior
 - 84-000341
- Thymallidae
 - Electrophoresis
 - 84-000295
- Thymallus arcticus
 - Distribution/Geographical
 - 84-000492
 - Spawning
 - 84-000492
- Tilapia mossambica
 - Culture/Propagation
 - 84-000014
 - Endocrinology
 - 84-000274
 - Gamete Storage
 - 84-000014
 - Heavy Metals
 - 84-000663
 - Mercury
 - 84-000663
 - Osmoregulation
 - 84-000274
 - Pentachlorophenol
 - 84-000671
- Tilapia nilotica
 - Culture/Propagation
 - 84-000042
 - Diets
 - 84-000042
 - Feeding Experiments
 - 84-000042
 - Lipid Metabolism
 - 84-000042
- Tilapia rendalli
 - Culture/Propagation
 - 84-000019
 - 84-000045
 - Polyculture
 - 84-000019
 - Transportation
 - 84-000045
- Trachurus symmetricus
 - Foods/Feeding
 - 84-000442
 - Life History/General
 - 84-000356
 - Population Studies
 - 84-000356
 - Trophic Relationships
 - 84-000442
- Trisopterus esmarkii
 - Electrophoresis
 - 84-000302
 - Population Genetics
 - 84-000302
- Typhlichthys subterraneus
 - Distribution/Geographical
 - 84-000490
- Umbrina canosai
 - Fishing Gear
 - 84-000729
- Urophycis tenuis
 - Spawning
 - 84-000408
- Wetmorella
 - Taxonomy
 - 84-000532

SYSTEMATIC INDEX

- Xenocyprininae
 - Karyotypes
 - 84-000294
- Xiphias gladius
 - Management/Research--Marine
 - 84-000766
- Xiphophorus
 - Electrophoresis
 - 84-000301
- Xiphophorus maculatus
 - Calcium
 - 84-000129
 - Endocrinology
 - 84-000157
 - 84-000210
 - 84-000248
 - Hormones
 - 84-000157
 - 84-000248
 - Olfaction
 - 84-000104
 - Reproduction
 - 84-000157
 - 84-000248
- Zacco temmincki
 - Coloration
 - 84-000174
 - Pigments
 - 84-000174
- Zeugopterus punctatus
 - Foods/Feeding
 - 84-000434
- Zoarcas viviparus
 - Aryl Hydrocarbon Hydroxylase
 - 84-000658

☆U.S. GOVERNMENT PRINTING OFFICE : 1984—776-071/4005

SUBSCRIPTION INFORMATION

For current subscription price contact:

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

U.S. Federal Agencies in wildlife-related fields and individuals or agencies who exchange domestic or foreign publications may receive free subscription to *Sport Fishery Abstracts* by writing to:

Editorial Office—*Sport Fishery Abstracts*
U.S. Fish and Wildlife Service
270 Aylesworth Hall, CSU
Fort Collins, CO 80523

CHANGE OF ADDRESS

If SFA is the first entry on the first line of your address label, send your new address and your former address *exactly* as it appears on your mailing label to:

The Government Printing Office
Superintendent of Documents
Washington, DC 20402

If a 5-digit number appears as the first line of the label, send your new address and your former address *exactly* as it appears on your mailing label to:

Editorial Office—*Sport Fishery Abstracts*
U.S. Fish and Wildlife Service
270 Aylesworth Hall, CSU
Fort Collins, CO 80523

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
EDITORIAL OFFICE
AYLESWORTH HALL, CSU
FORT COLLINS COLORADO 80523

PRESORTED
SPECIAL FOURTH-CLASS RATE
POSTAGE & FEES PAID
USDI
PERMIT No. G-77